

SPECIAL EDUCATION TEACHER KNOWLEDGE OF LITERACY:
AN ANALYSIS OF TWO PREPARATION PROGRAMS' EFFECTIVENESS IN
INCREASING SUBJECT-MATTER KNOWLEDGE AND PEDAGOGICAL CONTENT
KNOWLEDGE OF READING COMPREHENSION

By

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Abstract

Special educators' knowledge of reading concepts are not only influenced by their understanding of the subject matter, but also by an amalgam of content and pedagogy that enables teachers to integrate this information to meet the diverse needs of students with disabilities. This study documented the conceptual knowledge that special education teacher candidates acquired during the certification process in special education across two preparation programs. The study used concept maps to determine how teacher candidates teachers enrolled in these programs visually represented their conceptual knowledge of reading comprehension. Further analysis supported how teachers enact this knowledge into reading comprehension scenarios in their classrooms.

Dedication

For my children, Lindsey and Lillian.

My husband, Aaron

and

Sara Ellen Denny Beckwith

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No one can do great things, only small things with great love.

-Mother Theresa

This dissertation project is a combined effort of many from whom I have been fortunate to be a recipient of the small things they did for me with great love. I offer my sincerest gratitude and appreciation for your support. Each one of you has touched my life with kindness, friendship, and encouragement.

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CHAPTER 1

INTRODUCTION

The study of special education teachers' knowledge of the literacy needs of students with disabilities is important if we are to address the current low literacy levels (Perie, Grigg, & Donahue, 2005). Recent National Assessment of Educational Progress (NAEP) data indicate that 62% of eighth-grade and 65% of fourth-grade students with disabilities score below "basic" in reading skills, indicating that they lack the reading skills necessary to succeed in school and the world of work (National Center for Education Statistics, 2010). These dismal numbers warrant a comprehensive approach to better prepare students with disabilities to read and comprehend and better prepare teachers to instruct these students in reading. However, teachers of grades 4 through 12 typically receive little preparation in teaching reading comprehension and vocabulary skills (Snow, 2001).

To effectively address literacy skills, special education teachers need to have strong content knowledge of reading, as well as pedagogical skills specific to reading (Brownell et al., 2005). These are traits of "highly qualified teachers" as defined by the *No Child Left Behind* (NCLB) mandate (U.S. Department of Education, 2003). In an effort to prepare special education teachers to meet this mandate, teacher preparation programs are reexamining their program structures to incorporate more content knowledge (Cochran-Smith & Lytle, 1999, 2004). But what do special education teachers need to understand about reading content to improve the reading skills of students with disabilities? What effective teaching strategies have they learned from the classes taken during their preparation programs? These questions and others have raised awareness of the importance of understanding teachers' knowledge base in reading (Phelps & Schilling, 2004; Walsh, Glaser,

& Wilcox, 2006).

The current focus on teachers' content knowledge of basic reading skills is grounded in recent reading research (Goe & Coggs, 2007; Moats, 1994, 2009; Phelps & Schilling, 2004). However, this research has mainly focused on developing measures of teacher content knowledge and instructional effectiveness, not teachers' pedagogical content knowledge. Determining what a teacher knows about a specific subject like reading does not elucidate how they think about the content or use specific pedagogy to teach that content effectively; that is what defines pedagogical content knowledge.

Primarily, teacher knowledge research has focused on general education teachers who have received specific professional development in basic reading skills (Moats, 1994, 2009; Moats & Foorman, 2003; Piasta, McDonald Connor, Fishman, & Morrison, 2009). Only recently has the focus shifted to include the knowledge base of special education teachers in reading. However, studying special education teachers' knowledge of reading is difficult due to the nature of the population of students to whom they provide services. Special education teachers provide literacy instruction to students at multiple grade levels and with varying literacy skills. This raises the question of whether it is possible to effectively measure the level of knowledge that a special education teacher possesses in reading.

The practice-based theory for understanding teachers' knowledge of a content area is grounded in the work of Lee S. Shulman (Ball, Thames, & Phelps, 2009). Shulman (1987) classified teacher knowledge into seven domains of knowledge (see Figure 1). This undeveloped theoretical basis for teacher knowledge requires one to consider alternative theories of how teachers make sense of what they are teaching and how they think about delivering instruction. One potential theoretical conceptualization of teacher knowledge is

-
1. General pedagogical knowledge
 2. Knowledge of learners and their characteristics
 3. Knowledge of educational contexts
 4. Knowledge of education ends, purposes, and values
 5. Content knowledge
 6. Curriculum knowledge
 7. Pedagogical content knowledge
-

Figure 1. Shulman’s Domains of Teacher Knowledge (Shulman, 1987, p. 8)

Activity Theory. According to this theory, teachers construct knowledge when they have a chance to engage in discussion and develop “tools” to display this knowledge (Engeström, 1996). To understand knowledge as it is applied within the context of the classroom, Shulman’s (1986, 1987) distinctions between the domains of knowledge a teacher possesses provides a lexicon for differentiating the types of knowledge a teacher possesses about content, students, and the interaction of these within the school environment.

Further research is needed to understand what special education teachers have learned from their preparation programs about literacy skills like reading comprehension. The existing measures of teacher knowledge in reading have primarily been paper-and-pencil tests, teacher logs, and classroom observations. However, these measures lack reliability (National Institutes of Child Health and Human Development [NICHD], 2000) and are too distal from the act of teaching (Phelps, 2006). One approach to measuring how special education teachers think conceptually about content knowledge and pedagogy is concept mapping. Concept mapping represents the experiences, knowledge, perception, and memory

of the concept under study (Wheeldon, 2010). As such, this research tool provides a visual representation of the content knowledge and pedagogical content knowledge of a teacher by studying the semantic differences in the metacognitive construction of a map about particular concepts (Croasdell et al., 2003; Miller et al., 2009). Having teachers construct concept maps can help researchers understand the depth, breadth, and organization of the knowledge they have attained (Hill, 2004; Huer, 2005; Novak & Gowin, 1984; Ruiz-Primo & Shavelson, 1996).

One approach to measuring special education teacher knowledge is to have them construct concept maps around these areas of literacy (Cox et al., 1998; Trent & Dixon, 2004). However, only a small number of researchers have asked special education teachers in preparation programs to construct concept maps and only as a qualitative measure of their conceptual knowledge (Cox et al., 1998; Trent & Dixon, 2004; Leko & Brownell, 2011). This study represents an attempt to begin to fill this void focused on special education teachers and their construction of knowledge during their preparation programs of students with diverse needs in reading.

Purpose

The overarching goal of this study was to investigate the subject-matter knowledge and pedagogical content knowledge that special education teachers possess as they complete their preparation programs. This study consisted of two phases of data analysis. In the first phase of analysis, the syllabi from the required coursework in their program of study were analyzed for preparing special educators in relation to reading and literacy. In addition, the first phase included asking the teachers to construct concept maps around an area of literacy after instruction was given in concept mapping. In the second phase of analysis, select

teachers in these preparation programs responded to teaching scenarios of a reading comprehension lesson with their concept maps as a scaffold to provide recommendations for the teaching situation.

This study focused on undergraduate and master's level students with varying levels of teaching experience with adolescent students with disabilities. For this study, adolescent students will be defined by their placement in grades in fourth through twelfth grades. The focus on these grades was purposeful as students at this level are expected to use comprehension skills frequently. The teachers participating in this study came from varied certification routes, but are currently taking classes in one of two preparation programs. The preparation programs are part of a larger university system at publicly funded, four-year institutions. Both preparation programs are approved by the National Council for Accreditation of Teacher Education (NCATE) and produce the largest number of teacher graduates in their state. Historically, both preparation programs began as a Normal School. As stated in their department mission, one university preparation program emphasizes the skills special education teachers need to establish effective teaching and learning environments for individuals with disabilities in state, national, and global communities. The second university's primary mission is to develop culturally competent and ethical leaders and scholars in counseling and life-long education who are actively engaged in community, state, national, and global affairs.

Three measurement tasks were used for this study. First, the number of reading classes and experiences teaching reading in each preparation program were reviewed with an analysis of syllabi for all classes within the program. This data analysis discerned the range of preparation experiences around reading a special educator is exposed to during their

preparation programs. Specifically, the syllabi analysis surfaces if the literacy learning occurred in courses where the primary emphasis was on literacy or if literacy concepts were embedded within a range of courses.

Another data collection measure of this study assessed the special education teachers' knowledge of subject matter and pedagogical content knowledge. Concept maps were used as the measurement device for this aspect of the study. The teacher candidates in each program received a short tutorial on the components of a concept map by this researcher and then were asked to complete a concept map on reading comprehension.

A final measurement task used for analysis required a purposive sample of teachers to analyze a teaching scenario of special education teachers instructing students in reading comprehension. The teacher candidates were asked to analyze the scenario for quality indicators of instruction in reading comprehension and give input on how the lesson could be modified or improved to increase student reading comprehension skills. The special education teachers were also directed to relate the information from their personal concept maps to the teaching scenario. These data informed the bridging of practice to the conceptual understandings demonstrated by the teachers on their concept maps.

The conceptual framework for this study is based on the following premises (a) special education teachers learn subject-matter knowledge and pedagogical strategies within their preparation programs (b), teachers make sense of what they learn by appropriating “tools” or outward displays of their knowledge (i.e. concept maps), (c) special education teachers have a specialized knowledge of teaching reading due to the range of skills they encounter within their students' abilities in reading.

The following research questions were addressed in this study:

1. As captured in concept maps, what do special education teacher candidates report their conceptual understanding of subject-matter knowledge and pedagogical content knowledge of reading comprehension to be?
2. How do the experiences with reading instruction in their preparation classes mediate special education teachers' visual representation of their subject-matter knowledge and pedagogical content knowledge of reading comprehension?
3. What evidence of subject-matter knowledge and pedagogical content knowledge is represented in concept maps of special education teachers in preparation programs and how is it applied to their conception of effective instruction in reading comprehension scenarios?

CHAPTER II

LITERATURE REVIEW

For students to be able to read and comprehend what they read, they need teachers with both a thorough knowledge of the foundational principles and practices of reading, and the ability to deliver high quality instruction. That is, for a student to be successful, a teacher's subject-matter knowledge must be balanced with the contextual and pedagogical knowledge of education. This specialized knowledge is what makes good teachers great (Phelps & Schilling, in press; Shulman, 1987). What are these contextual and pedagogical skills in reading instruction that a teacher must possess? Is it possible to define what this specialized knowledge is and impart it to new teacher candidates? Is there a way to measure these skills that teachers employ to improve student performance? These questions have yet to be fully studied, especially as it relates to teaching adolescent learners. The purpose of this literature review is to gather evidence that attempts to answer these questions. It reviews existing literature in teacher knowledge in general, as well as knowledge specific to reading.

So many of the practices and procedures teachers employ while teaching reading are hidden in the classroom and not shared with the educational community. Stephanie Hirsh, executive director of Learning Forward, in a recent Education Week article, coined the term "islands of excellence" to describe the presence of expert teachers who are siloed and have limited opportunity sharing their knowledge of effective practices (Hirsh, 2010, para. 4). Many teachers are making an incredible impact on students' ability to read, but the practices are confined to their own classrooms (Fullan, 2007; Rosenholtz, 1989). Consequently, there is little evidence to ascertain what decisions these teachers make when confronted with the various levels of reading ability in the that same classroom. Hill and her colleagues (2008)

recognized a “lack of detailed understanding on how teacher knowledge affects classroom instruction and student achievement” (p. 2). This lack of understanding necessitates the study of teacher knowledge more deeply, especially in the area of reading. “Excellence in teaching is the single most powerful influence on achievement” (Hattie, 2003, p. 4).

Research supports the effect of highly qualified teachers on student achievement (Goe & Coggshall, 2007; The Teaching Commission, 2004). However, we have little knowledge about what these highly qualified teachers know and understand about delivering content. “Recent studies have shown teacher quality to be the single most important school-based factor influencing student achievement, surpassing school quality and other factors” (Hanushek, Kain, & Rivkin, 2002, p. 31). Unfortunately, there is little agreement from those who study teacher knowledge on what defines an effective teacher (Phelps, 2009).

The current trends in published work on teacher knowledge focus on the specific skills or traits a teacher possesses as a means of quantifying these traits. Measures for these skills are primarily indirect or analogous (Wilson, 2009) with little consensus on how to measure teacher skills and expertise (Lazur, 2009; Wilson, 2009). This literature review explores the current research in these areas.

First, this review focuses on the theoretical framework that informed this study and focused the literature for this review. Second, the historical foundation of teacher knowledge is reviewed to determine what is known that continues to inform the foundation for teacher knowledge. Third, the research on teacher knowledge will be explored to determine the current study of teacher knowledge. Next, teacher knowledge specific to reading will be addressed. The fifth section summarizes the literature on the measurement of teacher knowledge. The chapters will conclude with a comprehensive summary that links the

existing literature with the questions this study was designed to elucidate.

Theoretical Framework

Theoretical presuppositions for the process teachers use to teach reading comprehension is grounded in Activity Theory. Activity Theory postulates that when individuals engage in and interact with their environment, it leads to the production of tools (Ryder, 1998). Further, Activity Theory is characterized by continuous learning and iterative cycles of expanding on the new learning (Gregory, 2000).

Engeström (1987) articulated a methodology for organizational “learning by expanding” (p. 135) in which thinking about and making sense of new ways of working are important as lenses for critiquing the present and for bringing about systemic change. Engeström (1987, 1991a, 1991b) provides a way to explore these expansive transitions for analyzing emerging activities and research interventions (see Figure 2). Engeström’s (1987) model is useful for understanding how a wide range of factors work together to impact learning (activity). In order to reach an *outcome*, it is necessary to produce certain *objects* (e.g., experiences, knowledge, and physical products). These objects are visible forms of mental processes teachers undertake as they try to make sense of a literacy concept like reading comprehension and adapt it to for their students’ needs (Spillane, 2005). These mental processes are manifested in tools (i.e., concept maps) that can be accessed and communicated. As part of understanding how to understand how teachers conceptually understand reading comprehension in the larger system of literacy instruction, for example, they must engage in activities like concept mapping what they learn in their preparation programs in order to ingrain these concepts or tools in the fabric of their instruction.

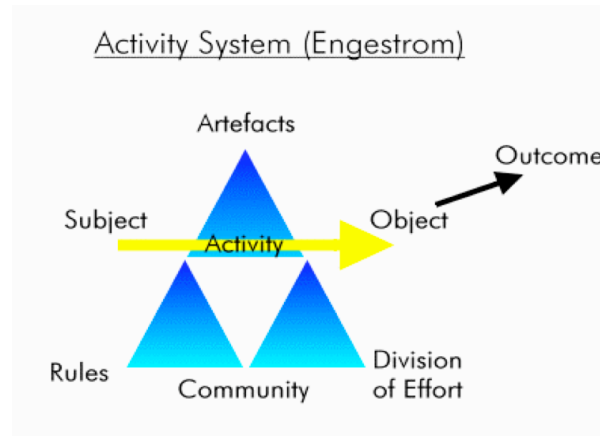


Figure 2. Engeström's activity theory model. Source: Engeström, 1987.

Foundations of Teacher Knowledge

Historical Perspective

This section will look at the progress that has been made historically to understand teacher knowledge and reading comprehension. The practice of teaching has received increasing amounts of attention over the last 20 years; however, our understanding of reading comprehension has only been the focus of researchers as of late. To understand the present educational climate, this review explored here the historical underpinnings of teacher knowledge and reading comprehension.

Dewey's conceptualization of knowledge. (Dewey, 1904, 1916/1964) first described the role of teachers as one that can bridge the territory between content and pedagogy. Dewey emphasized the use of scientific methods to approach subject matter stating that content and pedagogy are intrinsically linked and that, therefore, a teacher cannot think about the subject matter without thinking about the method to convey the content. In addition, teachers consider the needs of the students and their capacity to learn the content when making curricular decisions. He believed that the ways teachers classify, interpret, explain,

and generalize content is not based solely in knowing the basic tenets of the subject matter.

According to Dewey (1902), teachers are required to “psychologize” their content or rethink the learning of the content so that students can be engaged in “genuine intellectual activity” (p. 29). Further, good teachers recognize the relationship between subject matter and the method used to teach that particular content. He understood the intimate relationship between the delivery of knowledge and its link to student experiences with learning. Based on this conception of teachers’ scientific approaches to subject matter, the measurement of their methods, decisions, and beliefs is comprehensible. It is up to researchers working with teachers to discern what these knowledge structures are when they approach subject matter.

Fenstermacher’s philosophical construct. Fenstermacher’s work in the late 1970s drew attention to the need for a philosophical basis for judging teacher effectiveness. According to Fenstermacher, if one’s purpose is to enact change in schools then there is an “obligation of theoretical development” while conducting research (Fenstermacher, 1978, p. 159). Traditional views of teacher knowledge were declarative and procedurally based and highly conditional on how well the class was managed. That is, teachers were deemed knowledgeable based on student outcomes or products achieved within the process through which the lesson was taught (e.g., see Good & Brophy, 1971, 2008).

Fenstermacher (1978) argued that the research did not go far enough to examine the implications for practice. To be better able to prompt effective teachers, a further understanding of what constitutes effective instruction is needed. Consequently, the study of what distinguishes an effective teacher does not provide teacher educators with a succinct method to impart effective procedures to novice teachers. As progress is being made in teacher effectiveness research, the findings will inform how teachers are prepared.

Fenstermacher further cautioned that if the intention was to change teaching practices, then researchers needed to confront the subjective beliefs of teachers as part of the research design.

Fenstermacher (1980) believed that the decisions teachers make while teaching are guided by their personal thoughts, judgments, and decisions. Thus, when they encounter a student having difficulties understanding the content or needing more support, teachers will use knowledge of the subject matter in concert with their personal understanding of instruction to remediate the situation. Teachers are “automata” in their responses to student learning (Fenstermacher, p. 36). In other words, teachers automatically transfer their thoughts into action based on their understanding of the content and the context. Thus, the actions teachers take lead to multiple avenues that influence the outcomes for students.

Shulman’s categorization of teacher knowledge. During the 1980s, Shulman determined what constituted professional expertise as translated into content knowledge. This information was compiled for the Knowledge in Growth Teaching Project, a precursor for the National Board system of teacher certification. Shulman (1987) found there was a “missing paradigm” between content and its role in instruction; subject matter was only a context to understand aspects of teaching, not to define skillful instruction. Shulman (1986) introduced the phrase *pedagogical content knowledge* and sparked a new wave of scholarly articles on teachers' knowledge of subject matter and the importance of this knowledge for instruction.

Shulman (1987) conceived seven major domains to describe the facets of teacher knowledge (see Figure 1). Shulman’s conception of pedagogical content knowledge represented the unification of content and pedagogy as teachers considered how to make changes to instruction to meet the needs and interests of a diverse group of students. He felt

that a teacher who possessed these types of knowledge had advanced to the level of “content specialist” instead of simply a deliverer of instruction (p. 8). Teacher knowledge was evolving from generic teacher behaviors devoid of content, to specialized understanding of the nuances of the content in relation to the student.

Snow et al.’s continuum of teacher knowledge. In more recent years, Snow and her colleagues have described different stages of knowledge development teachers progress through, starting during their preservice training and continuing throughout their careers (Snow et al., 2005). At the initial stage of the continuum, teachers possess a “declarative knowledge” of teaching that is learned primarily from lectures and textbooks during their preservice program (p. 7). Declarative knowledge forms a core procedural knowledge that novice teachers will expand on during the first years of practice. During the initial years of teaching, educators advance their knowledge to include a “situated, can-do knowledge” in which they learn how to react to student needs that arise (p. 8). A teacher in this stage can determine what is the best instructional response when students do not understand the content being presented.

As a teacher increases her skills, a “stable procedural knowledge” is evident within the classroom (p. 8). At this stage of knowledge development, the teacher is adept at planning instruction for the majority of students in the classroom. The teacher can adequately design lessons that most students will understand, but maybe not all. Teachers may progress to higher levels of teacher knowledge as they reflect on their teaching. These higher levels include “expert, adaptive knowledge” and “reflective, organized, analyzed knowledge” (pp. 8-9). At the expert, adaptive stage, teachers adapt instruction and content with ease to deal with instructional challenges. When teachers in this stage are confronted

with a breakdown in learning that is novel or problematic, they search for ways to increase their knowledge about the area of concern. Teachers in this stage are often called upon to mentor other teachers or to increase the knowledge of colleagues.

The last stage of Snow et al.'s (2005) teacher knowledge continuum is the "reflective, organized, and analyzed knowledge" stage (p. 9). A teacher at this stage can synthesize information learned from various sources and determine its usefulness in the context of current classroom conditions. These so-called master teachers are often called upon to share their knowledge and skills with colleagues within the school and district, and also with those outside of the school setting such as teacher educators or researchers.

The stages of teacher knowledge, as described by Snow and her colleagues, potentially inform a theoretical basis for teacher knowledge if one subscribes to the idea that knowledge is acquired by teachers as they think about their instruction and reflect on how to improve upon their teaching within the context of students' learning content.

This historical perspective on teacher knowledge provides a foundation for the development of a conceptual framework of teacher knowledge. An initial conceptualization of teacher knowledge has a foundational basis in Dewey's belief that teachers employ scientific analysis of subject matter when making instructional decisions. Teachers interact with content in specialized ways that are dependent on students' active involvement in instruction. Specifically, teachers expand upon or modify the content to increase students' ability to comprehend the subject matter from systematic reflection of the results of the lesson. Whereas Dewey's progressive philosophy of schooling is used as the basis of experiential models of education, Fenstermacher cautioned that a theoretical basis is still needed to enact change when considering teacher's knowledge and practice. The need to

increase our understanding of how teachers conceptually understand reading and how it affects the delivery of content warrants further examination.

According to Fenstermacher, the field needs to understand what a teacher does when teaching subject matter and what specific instructional decisions they make when students stumble. Furthermore, Dewey believed that teachers are in a continual process of thinking about how the learner would best understand the content and engage in learning activities. Grounding further research in these two historical perspectives would aid researchers in developing a better understanding of what constitutes teacher knowledge.

Shulman attempted to establish the many types of teacher knowledge that are evident in instruction in an effort to come to terms with the multi-faceted nature of this knowledge. Later, Snow et al. undertook the task of articulating the progression knowledge takes as teachers move from preservice teachers to more experienced teachers. Whereas Shulman concentrated on the many facets of teacher knowledge, Snow et al. focused on the development of this knowledge base.

Both Shulman and Snow have greatly advanced what is known about teacher knowledge; however, what is yet to be determined is the extent of teachers' subject-matter knowledge, especially that of teachers of reading at the adolescent level. Conversely, evidence of subject-matter knowledge at the primary level in reading has been collected, but it is mainly focused on disciplinary knowledge. This will be discussed in length later in this review. However, further study is needed to discern the types of curricular decisions being made based on teachers' knowledge of reading at both the primary and secondary level. The social context of teacher knowledge is being explored in key content areas like math and science, but in the area of reading, especially adolescent literacy it is less realized. Further

study is needed to surface how teachers fundamentally understand content and the delivery of the subject matter to improve students' educational outcomes in reading.

History of Teaching Reading Comprehension

The history of teaching reading comprehension is relatively recent within the discipline of reading instruction. Early in the 1970s, Markman was one of the first to focus attention on how readers comprehend, or rather fail to comprehend or compensate with cognitive strategies while reading (1971, 1981). Markman's work advanced our knowledge of the importance of teaching cognitive strategies to readers to monitor their comprehension. Furthering this line of research, Durkin (1978) studied the amount of time educators spent on explicitly teaching students how to comprehend. She found that teachers delivered only 20 minutes of instruction on how to comprehend in over 4,000 minutes of reading instruction. Predominantly, comprehension instruction only focused on content-area skill development instead of self-regulated awareness of comprehension of this content (Trabasso & Bouchard, 2002). Comprehension was assessed by having students answer questions following reading or by assigning skill sheets.

Durkin (1978) suggested that effective comprehension instruction includes modeling, explaining, and providing feedback, while guiding students through learning activities. Pearson and Johnson (1978) responded to Durkin's ideas on reading comprehension in their book, *Teaching Comprehension*, by synthesizing the available research-based practices known at the time. Similarly, the International Reading Association published a 292-page review of reading comprehension research (Guthrie, 1981). By comparison, the current *Handbook of Research on Reading Comprehension* (Israel & Duffy, 2009) is 688 pages long and summarizes the present body of research on theory, methods, instruction, and assessment

of reading comprehension.

The revolutionary conception of actively teaching students how to comprehend prompted a plethora of research on comprehension that requires consensus within the discipline even today. Unfortunately, a similar study conducted by Collins-Block and her colleagues (2003) found that instruction of comprehension has not changed much since Durkin first studied teachers' practices. Thus, little time is spent on teaching students how to comprehend and the techniques used to evaluate comprehension are relatively low-level measures, such as answering questions following reading and on worksheets..

Current State of Teacher Knowledge as it Relates to Reading

In this section, recent studies are reviewed that investigate teacher knowledge as it applies to reading. As Hattie (2003, 2009) demonstrated in his research synthesis, good teachers matter. Teachers need a considerable knowledge base and expertise to address the diversity of skill levels encountered when teaching reading. This is supported by a plethora of research on teacher expertise and the resulting higher student outcomes (e.g., see Rivkin, Hanushek, & Kain, 2005; Wright, Horn, & Sanders, 1997). In short, a student has increased probability of sizeable academic gains if he or she has a quality teacher (Denton, Foorman & Mathes, 2003; Nye, Konstantopoulos & Hedges, 2004).

The increasing focus on teacher quality and expertise as a result of the No Child Left Behind Act (U.S. Department of Education, 2003) compels researchers to study teacher knowledge deeply. However, no studies to date describe the practices, procedures, beliefs, and attitudes of effective teachers (Hill & Ball, 2009; Ball et al., 2008). If we can identify the characteristics of what good teachers do, we can design preparation programs to develop these traits in preservice teachers. Elmore (2004) stated that educational practice at its core is

essential to understand if teachers are to have an impact on student performance. “How teachers understand the nature of knowledge and the student’s role in learning, and how these ideas about knowledge and learning are manifested in teaching and classwork” is crucial to recognize (p. 8).

What do good teachers know about teaching reading? What do reading teachers know about the interaction of reading development, curricula, and students’ response to instruction to design profound learning experiences? These questions are yet to be fully answered. What is lacking and the task that remains ahead of us as a profession, is documentation that teachers who possess this sort of knowledge actually teach better and more effectively (Anderson et al., 1985; Heibert, 2002; Snow, Griffin, & Burns, 2005).

In recent years, many professional organizations have attempted to define the attributes required for teachers with respect to reading (American Federation of Teachers, 1999; International Dyslexia Association, 1997; Learning Disabilities Association of America, 1997; Learning First Alliance, 2000). The majority of the resulting positions support the theoretical and scientific underpinnings of reading, but they do not delineate the subject-matter knowledge and pedagogical content knowledge that is needed to affect change for students who struggle with reading.

The International Reading Association (IRA) developed a position statement about what research-based characteristics distinguished an excellent teacher of reading. According to IRA, excellent teachers of reading demonstrate vital attributes of knowledge and practice including:

1. They understand reading and writing development and believe all children can learn to read and write.
2. They continually assess children's individual progress and relate reading

instruction to children's previous experiences.

3. They know a variety of ways to teach reading, when to use each, and how to combine the methods into an effective instructional program.
4. They offer a variety of materials and texts for children to read.
5. They use flexible grouping strategies to tailor instruction to individual students.
6. They are good reading “coaches” (that is, they provide help strategically). (IRA, 2000, p. 193)

These attributes fail to describe the pedagogical content knowledge of effective teachers of reading. Researchers are trying to hone in on these skills and attributes to determine their effects on instruction and student achievement in various subject matter areas; however, most of the work has been done in the areas of science and math.

Ball and her colleagues have dedicated 17 years to researching the subject-matter knowledge and pedagogical content knowledge teachers require in order to teach mathematics (Friel, et al., 1990; Hill & Ball, 2009; Hill et al., 2008; Rowan et al, 2001). Based on this extensive research with an emphasis on math, Ball and her colleagues have identified on certain dispositions, pedagogical insight, and subject-matter knowledge demonstrated by proficient teachers of mathematics. Math instruction requires significant mathematical knowledge, skill, habits of mind and insight to be able to interpret and analyze student work, provide a mathematical explanation that students can understand, and explicitly teach the links between mathematical concepts (Ball et al., 2008; Hill et al., 2008). Ball and her associates (2008) have concluded that in the area of math, if teachers do not know the subject matter well, they will not have the knowledge necessary to help students learn the content. This can be generalized to other content areas, including reading, which requires an even larger knowledge base considering the many facets of reading and language

that impact learning.

Transferring the research done in math to the area of reading, Geoffrey Phelps, a colleague of Ball, recently extended the work done in math to the area of reading. Phelps has studied the levels of knowledge a teacher possesses in reading as documented in responses to scenarios about reading instruction (Phelps, 2009). Therefore, studying teacher knowledge in reading is critical if we are to achieve the goals of the teacher quality mandate of the No Child Left Behind Act (U.S. Department of Education, 2003).

Researchers efforts to understand the essential components of reading acquisition, instruction, and how to increase competency in reading have led to reports such as Put Reading First: The Research Building Blocks for Teaching Children to Read from the National Reading Panel (NICHD, 2000) and the Reading Next report (Biancarosa & Snow, 2006). These two reports have greatly shaped educational policy, but what is yet to be understood is what effective teachers know about reading, what they do when instructing students in reading, and how to measure these skills to improve practice.

Phelps has primarily focused his research on measures of knowledge of effective teachers of reading, specifically teaching in kindergarten through third grade (Carlisle, et al., 2009; Goldschmidt & Phelps, 2009; Phelps, 2009). His research findings suggest there is a specialized knowledge teachers of reading must possess. Phelps contends that being a literate adult does not necessarily mean you can teach reading to students. In other words, just possessing the reading skills needed to read a newspaper article or similar piece of writing does not mean you can teach reading. “Strong content knowledge alone however does not ensure that a person knows how to represent the subject in ways that will enable students to learn” (Chester & Zelman, 2009, p. 140).

Reading teachers need a comprehensive understanding of reading and language development to promote student learning. This specialized knowledge goes beyond a basic understanding of reading content to the application of this knowledge with students (Carlisle et al., 2009). But what is this pedagogical content knowledge as it pertains to reading, especially for those who are teaching adolescents literacy skills?

Teacher Knowledge Specific to Reading

The research studies included in this review, for the most part, focused on teachers' knowledge of early reading skill acquisition, not on higher levels of reading development. Studies of adolescents reading skills and teacher knowledge were not available or were primarily descriptive. The research that is available on teacher knowledge specific to reading is presented below. The studies were considered for several factors as they relate to teacher knowledge in reading and separated by the principal focus of the study. Each study was reviewed to identify, if possible (a) study purpose, (b) experimental design, (c) instructional focus, (d) number of subjects, (e) learner outcomes, and (f) measure of teacher knowledge relative to instructional focus.

General Education Teachers' Subject-Matter Knowledge

Subject-matter knowledge includes the detailed domain knowledge teachers have about the specific skills of reading. These domains include areas such as phonemic awareness or comprehension skills. Six studies related to the subject-matter knowledge teachers have about reading as it pertains to beginning reading skills. Two studies were specific to special education teachers.

The first study in this review was conducted by McCutchen and colleagues (2002), who built hierarchical linear models and performed statistical analysis to compare the impact

professional development (PD) covering general on knowledge of reading had on participating teachers' instructional practices in relation to student reading achievement. Further analysis compared the results of teachers who were high implementers in comparison to teachers who implemented at a lesser degree what they learned in the professional development sessions.

In this study, forty-four kindergarten through first-grade teachers participated in a 10-day summer course that focused on increasing the teachers' linguistic knowledge. Prior to their participation in the PD, teachers completed an initial assessment of teacher knowledge, the *Informal Survey of Linguistic Knowledge* (Moats, 1994; Moats & Lyon, 1996). This survey assessed the teachers' knowledge of language structures such as the ability to identify individual sounds within words in comparison to the spelling of the word. Subsequently, teachers' general knowledge was further assessed using the *Cultural Literacy Test* (Riverside Publishing, 1989).

After participating in the PD, the teachers were observed throughout the school year and given three more days of PD focused on students' progress and instructional needs. Specifically, teachers were taught phonology and phonological development, the structure of orthography, and the importance of code learning as they integrate phonological awareness instruction into their lesson planning. Teachers were further taught to use spelling samples to diagnose students' difficulties in phonological, orthographic, and comprehension activities.

Results indicated that kindergarten students ($N = 492$) in classrooms of teachers who participated in PD and practiced high implementation made greater gains across the year in orthographic fluency (i.e., their ability to produce legible letters). First-grade students ($N = 287$) outperformed their control classroom peers in phonemic awareness,

comprehension, vocabulary, spelling, and composition.

The results of this study suggest that teachers' ability to use effective teaching practices could be increased when given PD in specific reading skills. A reported limitation of the study was that no separate statistical analysis was conducted to analyze the performance of teachers who participated in this study in comparison to their performance on the survey of teacher knowledge given to them prior to receiving PD. Further analysis of student achievement in reading in relationship to the scores on the surveys was not considered either. Yet another limitation was the focus was on kindergarten and first-grade teachers, a limited sample of teachers for comparing knowledge construction.

McCutchen et al. (2009) furthered this line of research knowledge with a study of the linguistic knowledge of teachers in grades 3 through 5. The results from this study indicated that the teachers' linguistic knowledge as measured by the *Informal Survey of Linguistic Knowledge* (Moats, 1994; Moats & Lyon, 1996), predicted higher student achievement in vocabulary, narrative composition, spelling, and word attack. Lower-performing students had statistically significant gains in these areas of reading when receiving instruction from teachers who scored higher on the test of linguistic knowledge. These results indicate that a teacher who possesses a strong knowledge of the structures of reading can positively impact student outcomes in attaining these skills.

Concurrently to the work of McCutchen et al. (2002), Moats and Foorman (2003) completed a four-year longitudinal study measuring teachers' subject-matter knowledge of language and reading. Third- and fourth-grade teachers ($N = 103$) from two low-performing school sites were given a survey of knowledge at the end of the first three years of this study. The survey was field tested prior to the study and contained questions that assessed

knowledge of speech sounds, morphology, phonological patterns, and orthographic rules. Teachers were also observed delivering instruction in reading to ascertain their overall effectiveness in delivering instruction in reading. Results were determined for variables that contributed to increased gains by students on the broad reading cluster of the Woodcock Johnson-Revised (McGrew, Dailey, & Schrank, 2007) using regression analysis.

The findings from the Moats and Foorman (2003) study indicated a low, but statistically significant relationship between teachers' knowledge of basic language and reading skills, effectiveness in delivering instruction in reading, and student end-of-year reading achievement. However, no controls for students' prior reading achievement were considered before the intervention. Results indicated that teachers' knowledge of reading does impact student achievement, but statistically significant differences were minimal and only experienced in one of the two sites that were part of the experimental group.

Based on the results from studies conducted by Bos et al. (2001) and Moats and Foorman (2003), Cunningham, Perry, Stanovich, and Stanovich (2004) compared teachers' disciplinary knowledge to their perceived subject-matter knowledge. A large sample of kindergarten to third-grade teachers ($N = 722$) was assessed to determine their knowledge of children's literature, phoneme awareness, and phonics. Teachers were then asked to rate their knowledge in these domains of literacy.

The purpose of the study was to calibrate teachers' perceived knowledge with the actual knowledge demonstrated on an assessment of dimensions of English language and children's literature. This assessment was given prior to a series of PD institutes on reading and writing instruction.

Results indicated that teachers demonstrated limited knowledge of children's

literature, phoneme awareness, and phonics before the institute. Interestingly, teachers rated positively their knowledge levels of the literacy skills assessed. However, the tests of knowledge did not confirm the teachers' opinions of perceived high levels of skill. Thus, teachers were inclined to overestimate their knowledge of reading subject matter. While it is important to understand that teachers tend to overrate their subject-matter knowledge, this study does not consider the efficacy of the teachers in delivering instruction in the measured literacy skills by correlating the outcomes for students in these areas of literacy.

Carlisle et al. (2009) expanded upon previous studies of teacher knowledge to determine if the teachers' test performance on measures of language and reading processes led to improved student reading outcomes. At present, there is only limited evidence to suggest that teacher knowledge leads to higher student achievement.

The Carlisle et al. study (2009) examined the contribution of first- through third-grade teachers' knowledge about early reading to their students' reading achievement as measured on the Iowa Test of Basic Skills (Hieronymus, Lindquist, Hoover, 1980) subtests of word analysis and reading comprehension. The teachers ($N = 977$) came from 112 elementary schools across the state that participated in PD as part of Michigan's Reading First initiative. The content for the PD was based on a program called *Language Essentials for Teachers of Reading and Spelling (LETRS)* (Moats & Foorman, 2003). The teachers were administered the *Language and Reading Concepts (LRC)*, a survey of knowledge that assessed the teachers' knowledge of phonemic awareness, phonics, fluency, vocabulary, and reading comprehension. These five components of reading instruction are outlined in the Reading First report (NICHD, 2000). The 56 items were derived from the content of the LETRS professional development and were administered in three parts throughout the school

year.

The initial analyses of all student achievement and teacher knowledge as assessed by the LRC only demonstrated a weak association. The researchers then controlled for variables such as students' sociodemographic characteristics and prior reading achievement and found only marginal improvements for third graders in reading comprehension, not first or second grade. Controls for teacher variables such as educational attainment and professional experiences only explained a small amount of variance between teachers (5-22%). However, sociodemographic characteristics appeared to have a higher statistical significance in reading achievement for students. Students in all three grades, except for those on free or reduced-price lunch or participating in special education services, showed improvement in certain skills such as word analysis and reading comprehension only.

The Carlisle et al. (2009) study suggested little correlation between teacher knowledge and student reading achievement. The researchers believed the assessment of teacher knowledge (based on the LRC) was psychometrically sound but may not be true measures of the knowledge teachers need to teach reading. A measure of instructional practices in reading was needed in this study to determine if these practices made an impact on student achievement when considering teacher knowledge.

Piasta et al. (2009) continued the line of research on the impact of teachers' knowledge on student achievement. To that end, Piasta and her colleagues studied the teaching practices of first-grade teachers ($N = 42$) who were required to use a highly scripted curriculum in reading as part of a larger reading initiative. The purpose of the study was to examine the teaching practices that impact student performance in relation to the specialized knowledge of language and literacy concepts of early reading skills. Specifically, the

researchers assessed teacher knowledge of word decoding in relation to the amount of time devoted to explicit instruction and if explicit instruction correlates with higher levels of teacher knowledge. In addition, the study explored the predictive significance of teacher knowledge and explicit practices on students' word identification competency.

The *Teacher Knowledge Assessment: Language and Print* (TKA:LP) was developed and field tested for this study. The TKA:LP survey consisted of 34 multiple-choice and 11 short-answer items testing teacher's knowledge of phonology, orthography, morphology, literacy acquisition, and instructional practices. The teachers' scores on this assessment ranged from 9 to 36 correct out of 45 possible questions ($M = 23.45$, $SD = 7.27$). Further observational data and videotaped lessons were examined to discern the amount of time that was allotted for instruction and other literacy activities in each teacher's classroom. To determine gains in word identification competency, students were administered the Woodcock-Johnson Tests of Achievement III Letter Word Identification subtest and the Picture Vocabulary subtest in the fall and then again in the spring.

Piasta et al. (2009) determined that, on average, students received 7.43 minutes of explicit decoding instruction. The scores of teacher knowledge on the TKA:LP were not predictive of a relationship between improved student word identification competencies and the amount of explicit decoding instruction the teacher provided. However, the longer amount of time allotted for explicit decoding instruction provided by teachers who scored at the 50th percentile or higher on the TKA:LP did impact the word identification skills of the first-grade students. Conversely, students of teachers who scored in the lowest 25th percentile and spent more time in decoding instruction demonstrated the weakest word identification competency.

These results should be interpreted in light of three limitations: (a) no direct link was established between higher teacher knowledge and increased student outcomes in reading; (b) time allotted for quality instruction had a greater impact on student achievement than other factors considered; and (c) no analysis of fidelity of implementing decoding lesson plans from the scripted curriculum was conducted. The process and procedures teachers used via the scripted curriculum were not explored nor was the impact of deviations from the curriculum and their effect on students' understanding of the lesson.

The studies reported above demonstrate the impact teachers with strong subject-matter knowledge had on the performance of students in reading. Unfortunately, general education teachers had a limited amount of this type of knowledge, even after intense training. Understanding the knowledge base of special education teachers in reading specifically will be reviewed in the following section.

Special Education Teacher Subject-Matter Knowledge

Spear-Swerling and Brucker (2004) continued this line of research on teacher knowledge in reading to special education teachers, in particular, the relationship between special education teacher preparation and reading gains made with second-grade children. Participating novice teachers ($N = 147$) were divided into three groups. Subjects in Group 1 ($n = 39$) were participating in a graduate-level special education class on teaching language arts to students with special needs and in supervised tutoring of elementary-aged children. The course contained information on English word structure and phonics. Teachers in Group 2 ($n = 49$) were taking the same course in special education in the evening; however, they did not participate in the tutoring component. A comparison group of teachers (Group 3; $n = 59$) in a different special education course did not receive instruction in word structures or

phonics. All three groups were pre- and posttested using *The Test of Word-Structure Knowledge* (Spear-Swerling & Brucker, 2003). This test consists of three measures of word-structure knowledge (graphophonemic segmentation, syllable types, and irregular words).

The results from the Spear-Swerling and Brucker study (2004) indicated that all participants, even those with a background in teaching reading, performed low on the pretest of word structures. However, Groups 1 and 2 demonstrated improved performance levels on the posttest measure. There were no significant differences based on background characteristics for the posttest measure. The authors concluded that the course content had a significant impact on performance more than levels of experience with reading across the instructional groups. More important, the teachers in Group 1 who scored higher on the posttest measure significantly impacted the progress their students made on pre- and post-measures conducted while they were being tutored. Tutored children improved significantly in knowledge of letter sounds, decoding, and reading and spelling of phonetically regular words.

The findings of Spear-Swerling and Brucker (2004) suggest that teachers in special education preparation programs can increase their knowledge of reading concepts based on the course content presented. The knowledge of novice teachers was influenced by direct instruction on word structures and the application of these skills within a tutoring session. Limitations to the study include a lack of random assignment between instructional groups and no comparison with other special education classes that focus on language arts. In addition, there was no comparison group of children being tutored to determine if the course content or the content of the tutoring sessions correlated with improved outcomes. Despite these limitations, however, the results of the pretest measures demonstrating low levels of

knowledge of a literacy concept heightens the need to increase the knowledge levels of teachers in reading if they are to impact students' ability to read and decode.

Attempting to understand special educators' knowledge of reading, Chessman and her colleagues (2009) examined the knowledge of phonemic awareness of first-year teachers certified in elementary, early childhood, or special education possess. The researchers contended that teachers working with students who struggle with reading acquisition need an understanding of the content, scope, and sequence of literacy instruction to provide explicit, comprehensive, intensive, and supportive instruction.

Based on this premise, the authors assessed 223 randomly selected first-year teachers with the Survey of *Teacher* PhAKS [Phonemic Awareness, Knowledge, and Skills] (Chessman et al., 2009). The survey consisted of items to measure teachers' knowledge of phonemic awareness instruction ($n = 9$) and the ability to identify, match, count and delete phonemes in written words ($n = 6$). Survey results were analyzed for level of knowledge of phonemic awareness, ability to distinguish between phonemic awareness and phonics, and any differences in knowledge and skills among special education teachers and general educators.

Results indicated that over half of the participants had inconsistent understanding of instruction of phonemic awareness and one third had very limited understanding despite 85% of the teachers providing some phonemic awareness instruction daily. A large percentage of special educators, 74%, could identify phonemic awareness activities linked to spelling tasks, but were not as proficient in determining other activities that develop phonemic awareness skills. Furthermore, a large proportion of all teachers confused phonics with phonemic awareness. When considering the differences between special and general educators, the

researchers found no statistically significant differences of knowledge of phonemic awareness knowledge or skills. The data from this study suggest that special education teachers are no better prepared to teach phonemic awareness than their general education peers. In addition, the study demonstrated that large percentages of the first-year teachers sampled were not proficient in knowledge of phonemic awareness.

The implications of the Chessman et al. study on the knowledge levels of teachers providing instruction to beginning readers are profound. The dismal results measuring a crucial literacy skill like phonemic awareness provides evidence that schools of education are not preparing teachers adequately to deliver instruction in reading. Measures of knowledge acquired while in special education preparation programs is needed to determine levels of proficiency of new teacher candidates.

In summary, the studies reviewed on teacher knowledge in reading demonstrate that knowledge of beginning reading skills that general and special education teachers possess can be improved through PD or course content. However, findings regarding the effect of such knowledge on student achievement are inconclusive. The measures used to assess teachers' knowledge were lacking in psychometric analysis and were often only modified versions of the *Informal Survey of Linguistic Knowledge* (Moats, 1994; Moats & Lyon, 1996). The validity of this survey has yet to be fully determined. A second limitation was the lack of in-depth study of how special education teachers use the knowledge they possess when instructing students in reading. Having strong subject-matter knowledge does not necessarily mean that a teacher has a keen sense of how to use that knowledge to instruct students.

The lack of research in these areas provides the foundation for further study specific to special educators who teach adolescents reading. Additionally, researchers need to expand

this line of study to include study of the effective practices of teachers to determine which have a greater impact on student achievement. Measuring teacher knowledge and the impact this knowledge has on student outcomes is an area that has yet to be fully developed. What student measures can be used to assess the knowledge of teachers and their instructional practices? This question is considered in the next section of this review.

Measurement of Teacher Knowledge

Identifying and then quantifying teacher knowledge are challenges yet to be conquered. An even more problematic challenge is how to link this knowledge to increased student outcomes. “There has not been a stable, consistent, and clear relationship between measures of teacher subject-matter knowledge with student achievement or any other indicator of teacher quality” (Wilson, 2009, p. 15).

Currently, estimates of teacher knowledge and expertise are derived from teachers’ credentials or aptitude (U.S. Department of Education, 2002). Historically, if a teacher managed the curriculum and classroom behavior well, she was considered an effective teacher. The credentials of the teacher such as years of experience or level of education were considered as an indication of teacher quality. “Although teacher knowledge is not as distant an indicator of quality and effectiveness as are measures of credentials, we consider measures of teacher knowledge to be necessary but not sufficient evidence of teacher quality and effectiveness” (Chester & Zelman, 2009, p. 139).

General measures of teacher knowledge. Multiple measures to determine a teachers’ expertise, including teacher credentials, tests of teacher knowledge, observational evaluations of teacher practice, and consideration of student outcomes on teacher performance, are being utilized (Gitomer, 2009). For example, Hill and Ball contended that a

measure of subject-matter knowledge is not enough unless effective classroom practices are considered as well (Hill & Ball, 2009; Chester & Zelman, 2009)

Many believe using student outcomes data is a reasonable tool to measure teacher knowledge (Gitomer, 2009). However, others believe that these measures are too distal to measure the specialized expertise of the teacher (Wilson, 2009). Kennedy (1999) identified four levels of approximation of teacher knowledge to student learning, which range from the closest measures of student progress to the most distant. Classroom observations and standardized tests are Level 1 approximations. Kennedy considered these as the most direct measures of teacher knowledge that are available to researchers. At this time, current legislation concentrates the evaluation of teacher expertise on standardized test scores. According to Kennedy, Level 2 approximations involve situated descriptions of teaching. These descriptions require teachers to illustrate in narrative form their own teaching practices. These teacher logs provide potentially accurate descriptions of what the teacher has taught, but not how well students learned the content. Any measurement of student learning cannot be tied directly to the description of the lesson as prior background knowledge is not determined. Conversely, Level 3 approximations utilize nonsituated testimony about practice. That is, teachers reflect on their practice during interviews or on teacher questionnaires. Since the teaching act is not situated in the context of the classroom, the teachers' responses tend to be generalizations of what transpired. Finally, the most distant measure of student learning and teaching environment, Level 4 approximations rely on testimony about the effects of policies or programs. Teachers are asked to report on their understanding and particular stance on an educational policy that affects them. Personal bias and misunderstandings about the policy may influence the results from this type of measure.

Considering that Level 1 approximations of teacher knowledge such as student assessment data or classroom observations are the closest measure available at this time, further research on more proximal measures is needed. Wilson (2009) contended that one approach to designing such a measure would be to backwards map from national standards for teacher preparation. However, this approach to designing a measurement device would not account for the situated learning teachers acquire while actually teaching. Additional devices to measure teacher practice would have to be developed as well.

Stein and Matsumura (2009) argued that measures of teacher knowledge should be direct and grounded in the real work of teaching. They designed a study that asked English language arts teachers ($N = 34$) to provide four response-to-literature assignments. For each assignment, the teachers completed a two-page description of the learning task and the criteria they used to grade students' work, along with submitting four samples of student work (two they considered to be of high quality and two of medium quality). This idea of observing teachers and then asking them to describe the task being taught provides an interesting methodology for studying teacher knowledge.

The results of measuring teacher practice indicated the quality of the lesson being taught and the merit of the materials being used. Specific indicators of student opportunities to learn were visible in this type of assessment. Whereas this study determined that the type of materials teachers use and the quality of how students are asked to demonstrate their understanding are indicators of teacher knowledge, this only explores two dimensions of the multifaceted and complex nature of teacher knowledge. What are the dimensions of teacher knowledge that can be assessed? Which dimensions have the strongest correlation to student outcomes? These questions are yet to be answered by researchers, but a few researchers have

tackled the multidimensional nature of teacher knowledge in reading.

Developing a measure of teacher knowledge in reading. Expanding on this idea to assess teacher knowledge in reading, Phelps and Schilling (2004) conducted a psychometric analysis to determine the dimensions of teacher knowledge that are measured. The researchers felt that previous research in teacher knowledge focused primarily only on one dimension of knowledge which is subject-matter or disciplinary knowledge. Instead, they contended that two dimensions are inherent to teaching reading.

The first dimension is the subject -matter knowledge of reading or the specific knowledge of the discipline of reading that informs teachers' understanding of the individual skills that students must acquire to read and comprehend. Examples of this discipline knowledge include topics such as phonological awareness or text structures. As this literature has demonstrated, current assessments of teacher knowledge tend to focus on the measurement of this type of disciplinary knowledge.

The second dimension of reading encompasses the knowledge a teacher possesses across the continuum of reading skills and the application of these skills across subjects. In this dimension, teachers integrate subject matter and make instructional decisions based upon an analysis of student outcomes. These instructional practices and student interactions within the context of the classroom work in synergy as the teacher does the “work of teaching reading” (Phelps & Schilling, 2004, p. 36). Measuring teacher practices and content decision-making across the contextual parameters of reading instruction has yet to be accomplished.

Phelps and Schilling (2004) strived to create new measures of teacher knowledge that would transcend the dimensions of teacher knowledge in reading. The researchers developed

a measure that would be sensitive not only to teachers' subject-matter knowledge but also to the effects of this knowledge on instructional practice and student outcomes. The 261-item measure was piloted during the California Professional Development Institute, a publicly funded effort to increase the knowledge of elementary reading teachers. Over 1,500 teachers participated in the pilot phase of this study. Considering the large pool of items ($n = 261$), the questions were divided into three different forms that were given to teachers participating in the weeklong institutes: (a) knowledge of content, (b) knowledge of students as they interact with the content, and (c) knowledge of teaching in relation to content.

The results of the factor analysis across comprehension and word analysis indicated that teachers possess a specialized knowledge of reading that transcends general reading ability to include the numerous dimensions of subject-matter knowledge. Further factor results strongly suggested that knowledge of teaching in relation to content is impacted not only by subject-matter knowledge, but also an understanding of delivering the content within the context of the classroom. This finding provides evidence that pedagogical content knowledge for teaching reading is measureable. Tools to measure pedagogical content knowledge can describe the differences in the ways teachers teach reading and the resulting impact on student achievement.

Phelps (2009) has continued this line of research to validate measures of teacher knowledge in reading. Using the *Content Knowledge for Teaching Reading* (CKTR) assessment (Phelps, 2005, 2006; Phelps & Schilling, 2004; Rowan et al., 2001), teachers' knowledge of content and students and the interaction of these domains within the classroom context are assessed. Specifically, the knowledge of reading skills such as comprehension and word analysis are assessed with scenarios that ask teachers to analyze such things as the

curriculum materials used or correct answers to student questions during a lesson. The scenarios require teachers to consider their knowledge of teaching reading content and student interactions with this content to respond to the situation described in the text of the question.

Teachers ($n = 50$) that participated in this study, as well as a group of nonteachers ($n = 55$), were given the *Nelson-Denny Reading Test*, an assessment of general reading ability (Riverside Publishing, 1993). No significant difference in reading ability of teachers and nonteachers ($t = 1.92, p > .05$) were evidenced. As a result, Phelps contended (2009) that any difference in groups on the CKTR can be attributed to the specialized knowledge of reading from the participants in this study. The teachers and nonteachers were then administered the CKTR; large differences between the two groups emerged on this assessment (low = .92, high = 1.41).

These findings suggest that the CKTR is sensitive to the specialized knowledge teachers have for reading compared to common knowledge of reading. Upon further study using regression analysis, Phelps (2009) found that teaching experience and high Nelson-Denny score were correlated with high content knowledge on the CKTR. Phelps concluded that experienced teachers of reading possess a highly specialized knowledge beyond the general knowledge of reading of those who don't teach.

A limitation to Phelps' study (2009) was evident in the population sample. The teachers in the study came from one suburban school district that had a history of extensive PD opportunities in reading. Therefore, the sample may not reflect the diversity of knowledge or experiences with reading evidenced in a larger sample of teachers.

In summary, measurement of teacher knowledge in reading consists largely of

measures of teachers' subject-matter knowledge. This type of assessment has produced inconclusive findings on the correlation to student outcomes. Other measures of teacher knowledge such as aptitude tests or credentials are currently the norm for being certified to teach, but they are too distal to student outcomes. The complexity of how to measure teacher knowledge and creating valid measures that are sensitive not only to subject-matter knowledge, but also to pedagogical decision-making are yet to be realized. The dimensionality of understanding and delivering the content in such a way that students learn compounds the issue of what facet of knowledge to measure. Exploring alternative measures of teacher knowledge beyond multiple-choice tests of subject-matter knowledge is the primary focus for the study being undertaken for this dissertation. Determining ways to measure how special education teachers conceptualize and enact knowledge of literacy provides the impetus for teacher educators to improve their practice in preparation programs. Such understanding of how teachers make sense of the content provided in coursework can improve teachers' expertise to deliver effective literacy instruction.

Summary

The research on teacher knowledge thus far has focused on the subject-matter knowledge of elementary teachers. The historical perspectives, as well as more current attempts to understand teachers' knowledge have exposed the need for information about, as well as the limited research base on of teacher knowledge, thus the need for further research. Dewey (1902, 1916/1944) laid the foundation of knowledge as it is applied to teachers that later informed the work of Fenstermacher and Shulman as they tried to conceptualize and define the theoretical and descriptive framework of teacher knowledge.

In more recent years, Snow and her colleagues have attempted to describe the

progression of teacher knowledge the preservice years and continuing throughout teachers' careers. However, a theoretical basis for understanding how teachers demonstrate subject-matter knowledge and pedagogical content knowledge is yet to be fully established. Current educational policy heightens the urgency to understand the specialized knowledge of teachers and provides a context for teacher knowledge structures, yet there is no consensus on what constitutes knowledge within a discipline and how to measure it. Researchers in the areas of math and science have started to travel down this path to understand pedagogical content knowledge in relation to the discipline, but they are still developing consensus. To borrow from Robert Frost, one could say teacher knowledge in reading is *the road less traveled*. Teacher knowledge in reading has yet to be explored beyond reading acquisition and is nonexistent for adolescent learners.

At the beginning of this literature review several questions were posed in hopes of findings answered by studying the available research on teacher knowledge. These questions included: What are these contextual and pedagogical skills in reading instruction that a teacher must possess? Is it possible to define what this pedagogical content knowledge is and impart it to new teacher candidates? Is there a way to measure these skills to improve student performance? This review provided some insights on how to answer these questions, but ultimately the questions were not fully answered.

To answer the first question on the contextual and pedagogical skills a teacher must possess, yes, good teachers possess a specialized knowledge of reading as Shulman (1987) and Carlisle et al. (2009) were able to ascertain. But as Phelps (2009) and Ball et al. (2008) pointed out, this pedagogical content knowledge has yet to be defined adequately in reading.

The second question was designed to elucidate how to improve the ability of teacher

educators to communicate subject-matter knowledge and pedagogical content knowledge to teachers, specifically preservice teachers. As Spear-Swerling and Brucker (2004), Moats and Foorman (2003), and McCutchen et al. (2002) demonstrated intense instruction in key literacy skills can be delivered to teachers that can impact their knowledge of reading acquisition. The course content in preparation programs and PD development given to teachers can impact their teaching practices for the better, but how we communicate the effective practices to teachers within the context of the classroom is yet to be realized.

The third question inquired about the feasibility of measuring teacher knowledge in relation to student performance. This question cannot be fully answered given the literature available today. As shown in the studies by Carlisle, Correnti, Phelps, and Zeng (2009) and Piasta et al. (2009), student outcomes are difficult to measure, and several factors such as alignment of test items to the content being delivered and student and teacher factors produce only minimally significant results. Considering the current approximations of teacher knowledge to student outcomes that Kennedy (1999) surfaced, the field of diagnostic measures for student achievement in the context of the classroom setting is only a fledgling enterprise.

Finally, the fourth question this review attempted to answer was the possibility of designing measures of teacher knowledge in reading. As Chester and Zelman (2009) as well as Wilson (2009) demonstrated, situated measures of teacher knowledge are complex to devise, and it is difficult to draw a correlation to student outcomes. Phelps and Schilling (2004) and Phelps (2009) attempted to design a measure that not only described teachers' subject-matter knowledge of reading, but also their instructional practices when they deliver this content.

In conclusion, this literature review has revealed the complexity as well as the exciting opportunities for research on teacher knowledge. The glaring lack of information on of the specialized knowledge teachers of adolescent readers must possess demands investigation. When one considers the vocabulary load, as well as the high levels of background knowledge adolescents need to read grade-level text, the need to study the distinct skills of special education teachers becomes paramount.

CHAPTER III

METHODS

This study focused on graduate- and undergraduate- level students completing a special education certification program. The purpose of this study was to investigate the subject-matter knowledge and pedagogical content knowledge that special education teachers possess as they complete their preparation programs. Specifically, this study set out to understand (a) how special education teacher candidates represent specific knowledge types, (b) how preparation classes mediate knowledge of reading comprehension, and (c) how special education teachers enact their knowledge represented to a teaching scenario. A mixed-methods approach (Creswell & Clark, 2010) was used to gather and interpret both qualitative and quantitative data to answer the research questions. This study represents the first effort to discern the knowledge base special education teachers possess about reading comprehension using concept maps.

Participants

These teacher candidates came from varied certification routes, but were currently taking classes in one of two accredited universities. Participants ($N = 74$) were asked to supply basic demographic information such as age, number of years of teaching, and both undergraduate and graduate preparation experience (see Table 1). The number of teacher candidates who participated in the study was based on adequate numbers of participants to conduct equivalent analyses.

Setting

This study situated itself across two preparation programs in the area of special education. The two preparation programs are housed within their larger university structure

Table 1

Demographic Information on Study Participants

	University A	University B
Gender	M = 8 F = 43	M = 5 F = 18
Years of teaching experience	None = 33 1-3 = 9 4 or more = 9	None = 4 1-3 = 17 4 or more = 2
Degrees conferred	Education = 3 Special Education = 1 Outside of Education = 13 None conferred = 34	Education = 1 Special Education = 0 Outside of Education = 22 None conferred = 0
Certification	Learning Disabilities = 11 Developmental Disabilities = 14 Emotional/Behavioral Disturbance = 7 Cross Categorical = 6 Special Ed Minor = 5	Learning Disabilities = 4 Developmental Disabilities = 0 Emotional/Behavioral Disturbance = 0 Cross Categorical = 18 Special Ed Minor = 1

and are accredited by the National Council for Accreditation of Teacher Education. Both preparation programs are in the Midwest section of the United States and have the largest teacher preparation programs in their state. The preparation programs are similar in their focus and epistemology for preparation of teachers. One university preparation program (University A) is characterized by their commitment to prepare effective teachers who can create learning environments for individuals for disabilities. The second university (University B) focused in their mission statement on the development of culturally competent and ethical leaders in the community. To secure participation, the researcher contacted the

special education chairs to obtain permission to conduct the study within a special education certification class (see Appendix A). Inquiries about the human subjects approval process were made and all requirements for approval were completed. All personal communications via telephone with the universities were recorded in a log taken about what transpired during the phone call. Any electronic communications were archived during the inquiry process.

Procedure

This dissertation study was submitted to the University of Kansas Human Subjects Committee-Lawrence for approval. Once approved, a field trial of the study was conducted within a graduate-level special education class at the University of Kansas. Students in this class participated in the concept mapping presentation and then were asked to concept map about their knowledge of reading comprehension. Upon completion of the maps, field study participants completed a survey requesting their feedback on the activity of concept mapping and the presentation itself. Based on the feedback, any reasonable modifications to the presentation were considered and made. The maps obtained during this field study were analyzed using quantitative scoring techniques to determine the sensitivity of the assessment to measure teachers' conceptual knowledge of reading comprehension.

All students in the targeted classes from University A and B were invited to participate in the study and received an orientation to the study during one 20-minute session (see Appendix B). Consent was secured at the orientation session (see Appendix C). All students in the classes participated in the instruction on concept mapping, however, only the data for students who returned signed consent forms were used. To ensure anonymity and/or confidentiality, all identifying information on the products such as name, student identification number, or employment location were obliterated after interview participants

were selected. Products created by students who did not return consent forms were given to the instructor of record and not kept for analysis. Incentives for participation in the concept mapping activity, as negotiated with the lead instructor for each class, consisted of participation points for the class session.

Methods of Collecting Data

Analysis of Syllabi

In the first phase of the study the number of reading classes and experiences teaching reading in each preparation program was reviewed with an analysis of syllabi for all classes within the program. The purpose of the analysis of syllabi was to provide a descriptive assessment of each preparation program that informed any comparison between schools, as well as a quantitative assessment of the breadth of knowledge of reading to which teachers in a given program was exposed. The syllabi from the course sequence of a preparation program were collected and analyzed for levels of implementation using the Innovation Configuration Syllabus Evaluation Form (Smartt & Reschly, 2007). The Innovation Configuration Syllabus Evaluation Form specifically assessed the degree to which selected evidence-based practices were implemented in required reading courses (Smartt & Reschly).

The syllabi were quantified across these three distinct components and used to determine the extent to which each preparation program emphasized literacy concepts. The syllabi were scored across a matrix based on the number of instances when reading, reading comprehension, and literacy were referenced in each course (see Appendix G). This data analysis discerned the range of preparation experiences around reading special educators were exposed to during their preparation programs. This syllabi analysis also surfaced if the

literacy courses were stand-alone classes where the primary emphasis was on literacy or if literacy concepts were embedded within a range of courses.

The university preparation focus on literacy is crucial for determining if different variables increased the knowledge of reading by special education teachers. While the probability of causation is not suggested by the sampling of two different preparation programs, it did provide correlations across different variables.

Concept Maps

A second source of data collection for this study assessed the special education teachers' knowledge of the reading comprehension with concept maps as the measurement device. The teachers received a short tutorial on the components of a concept map by this researcher and then were asked to complete a concept map on reading comprehension. The purpose of the concept maps was to assess participants' understanding of reading comprehension. Concept maps provide a structured approach to exploring connections between and among concepts using linking words (Wheeldon, 2010). The use of concept maps for research purposes has employed both quantitative and qualitative approaches to analyze the hierarchical relationships between concepts. Concept maps provide an accurate estimate of not only a teachers' schema for a particular concept, but also their attitudes and beliefs about the topic (Correa, Hudson, & Hayes, 2004; Trent et al. 1998, Trent & Dixon, 2004). Specific to the concept of reading comprehension, concept maps provided a structure to measure teachers' subject-matter knowledge, in addition to their pedagogical content knowledge.

Researchers have increasingly recommended the use of concept maps to trace conceptual change (Artiles & McClafferty, 1998; Webb-Johnson, 1998). Morine-Dersheimer

(1993) studied three different approaches to measuring conceptual change and found concept mapping to be the most reliable and productive measure of qualitative change, as well as statistically significant quantitative change among preservice teachers.

Likewise, Miller and his colleagues (2009) used “expert maps” to compare levels of knowledge on concept maps based on weighted responses to better calculate the gains in knowledge as the result of course content. Furthermore, Trent et al. (1998, 2004) categorized responses on maps into three themes: examples, hierarchies, and cross-links. These researchers also cited a fourth theme, relationships, as an important component for the quantitative analysis. Each of these themes was awarded points based on complexity of conceptual thinking. Further qualitative comparison of pre and post maps was conducted after instruction given. Finally, Correa et al. (2004) employed a method of rule-guided categorization based on student responses on concept maps to ascertain the change in conceptual thinking and belief systems after instruction in a teacher education program.

Based on these different approaches to analyzing knowledge as depicted on concept maps, the procedures used for this study merged the work of Trent et al. (1998) to award points to the examples, relationships, hierarchies, and cross-links (see Figure 3) with the categorization of concepts as described by Correa et al. (2004).

A system to code and classify concept map responses, as adapted by Trent et al. (1998), provides a way to classify and measure differences between the types of responses and concepts on the maps. Using Jones and Vesilind’s (1996) definitions, teachers’ responses were coded as examples, relationships, hierarchies, and cross-links. Each of these codes was assigned a point value that was subsequently used to determine statistical

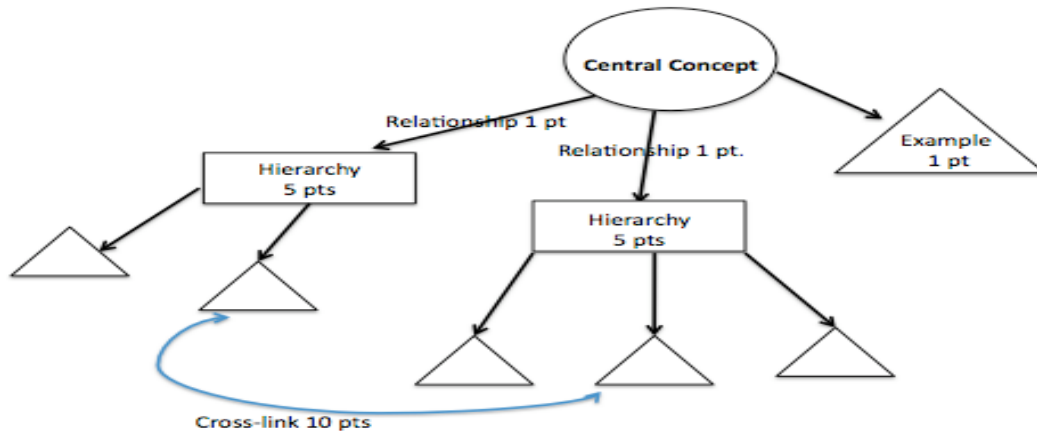


Figure 3. Concept map scoring procedures

significance across variables. Coding procedures for the study included:

1. examples are “valid instances of a concept”;
2. relationships are the “connecting lines and linking words between two concepts”;
3. hierarchies are “connections among concepts and examples, from general to specific”;
4. cross-links which represent the connections between hierarchies. (Jones & Vesilind, 1996, p. 96)

Examples were awarded 1 point for each valid example; 1 point for each valid relationship; 5 points were given for each valid hierarchy; and each cross-link was awarded 10 points. Correct propositions were awarded points that were used to compare means across responses for each teacher’s concept map.

Reliability was achieved by reaching inter-rater agreement on the scoring procedures across concept maps. Linguistic and conceptual similarities were accounted for in this scoring process.

Concept Map Analysis Form

Further analysis of concept maps was completed using a Concept Map Analysis Form

(see Appendix E) to obtain a more detailed and specific analysis of responses and to decipher what types of knowledge teachers possess about reading comprehension. The purpose of the concept map analysis was to examine participant responses and differentiate the responses into two categories: subject-matter knowledge and pedagogical content knowledge.

These two categories were organized into a Concept Map Category Analysis Form (see Appendix E) in order to allow for a more detailed and specific analysis of responses. This chart was developed using the current literature on reading comprehension and the definitions set forth by Shulman (1987) for each category heading (i.e. subject-matter knowledge). This analysis form was reviewed by an expert review panel consisting of individuals deeply knowledgeable about reading comprehension to determine the veracity of the form. The expert panel included three faculty members from a large Midwestern university with expertise in teaching reading and reading research. The sophistication of map category scores were computed by summing the number of responses or subtopics under each category based on their level of knowledge on the concept maps- example, relationship, hierarchy, or crosslink.

Categorization procedures, as described by Correa and her colleagues (2004), provided a basis for the differentiation of concept map components into two categories to answer one of the research questions for this study. Concept map elements were sorted into two categories: subject-matter knowledge and pedagogical content knowledge. These two categories relied on the definition set out by Shulman (1987) for each domain of knowledge.

Subject-matter knowledge (SMK), as described by Shulman, encompasses what a content specialist knows about the content they teach. This includes the curricular knowledge materials and resources for teaching particular content, including how subject

matter is structured and sequenced in these materials.

Shulman's conception of pedagogical content knowledge includes the teachers understanding of what teaching practices best fit the content being presented and how best to teach this content to foster meaningful understanding by students. Pedagogical content knowledge (PCK) is "the ways of representing and formulating the subject that make it comprehensible to others" (p. 9). This domain of knowledge requires a deeper understanding of not only the content or general pedagogical principles, but also the transformation of content into specific teaching practices.

Interviews With Scenario Component

The purpose of the semi-structured interviews was to support further triangulation of the data between the quantitative scoring of concept maps and the categorizing of knowledge into two domains. Three purposely selected participants from each preparation program were chosen to take part in the interviews based on their concept map level of complexity and their willingness to participate. The selection process for these interview participants was based on a comparison of the means of individual scores on the concept map with the group norms for each class.

During semi-structured interviews, specific questions about the representation of their knowledge as well as application of that knowledge within a teaching scenario were conducted (see Appendix D). The use of scenarios provided a distal measure, not a proximal measure, of how teachers then enacted this knowledge with their students. Those who agreed to participate in this second phase of data collection were compensated for their involvement.

The interviews asked general questions about their experiences learning about reading comprehension and their familiarity with this aspect of literacy. In addition, scenarios were

presented to the interviewees that asked them to suggest ways to improve or expand upon a reading comprehension lesson. The responses to the scenarios were analyzed to determine evidence of components of concept map in the scenario suggestions. Coding of scenario suggestions were analyzed against the Concept Map Category Analysis Form and triangulated with the individual concept map responses. All interviews were recorded and transcribed to determine accuracy of statements.

In conclusion, all of these measures provided the researcher with a better understanding of the schemas teachers create when participating in a preparation program. The rationale for using those methods and analysis is theoretically grounded in the assumption that teachers make sense of knowledge within an activity system where they are able to connect new knowledge with tools, in this case visual representations (i.e. concept maps).

Study Design

The study used a mixed-methods design to examine both quantitatively and qualitatively the level of knowledge of teachers participating in a preparation program for certification in special education. A mixed-methods procedure for collecting, analyzing, and integrating both a quantitative and qualitative data was used at two different stages of the research process within this study and employed explanatory sequential design. Explanatory sequential design provides a better understanding of a phenomena than simply a quantitative approach (Creswell & Clark, 2010). Explanatory research design consists of two distinct phases: quantitative data collection and analysis followed by qualitative data collection and analysis (see Figure 4).

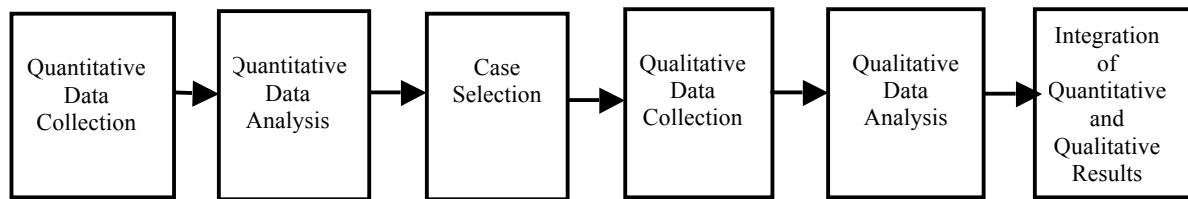


Figure 4. Explanatory design diagram (Adapted from Creswell & Clark, 2010).

During the first phase, quantitative (numeric) information was collected using an analysis of syllabi across the certification programs for each preparation program as well as the concept maps of reading comprehension constructed by teachers in a course. In the second stage, qualitative information from semi-structured interviews was collected to help explain or elaborate on the quantitative results. Table 2 delineates the research questions using quantitative and qualitative methods and the data sources that were used to address these research questions. The rationale for mixing both types of data is that neither quantitative nor qualitative approaches by themselves provided a complete description of the nature of teacher knowledge present for teachers in a special education preparation program.

Table 2

Research Questions and Data Sources

Research Question	Methodology	Data Source	Purpose
1. As captured in concept maps, what do special education teacher candidates report their conceptual understanding of content knowledge and pedagogical content knowledge of reading comprehension to be?	Quantitative (Phase 1)	Concept maps	Provides a structure to measure a teacher candidate's level of conceptual knowledge
	Quantitative (Phase 1)	Concept map scoring procedures	Coding and classifying concept maps to measure differences between types of responses and concepts on the maps
2. How do the experiences with reading instruction in their preparation classes mediate special education teachers' visual representation of their content knowledge and pedagogical content knowledge of reading comprehension?	Quantitative (Phase 1)	Syllabi analysis - Innovation Configuration	Discerns the range of preparation experiences around reading a special educator is exposed to during their preparation programs
3. What evidence of content knowledge and pedagogical content knowledge is represented in concept maps of special education teachers in preparation programs and how is it applied to their conception of effective instruction in reading comprehension scenarios?	Qualitative (Phase 2)	Concept maps	Illustrates conceptual understanding demonstrated by teacher candidates
	Quantitative (Phase 1)	Concept Map Analysis Form	Provides a more detailed and specific analysis of responses
	Qualitative (Phase 2)	Interviews	Answers specific questions about their concept maps and how teacher candidates enact their knowledge

CHAPTER IV

RESULTS

Analysis of the data for this study consisted of two phases: quantitative and qualitative. In the first phase, the syllabi were analyzed from the required coursework in the two participating universities' programs for preparing special educators in relation to reading, reading comprehension, and literacy. In addition, the teachers were asked to construct concept maps around an area of literacy after they had been instructed in concept mapping. In the second phase of analysis, the concept maps were analyzed across two domains of knowledge as defined by Shulman's (1987) Domains of Teacher Knowledge (see Figure 1). In the second phase, select teachers in the preparation programs participated in a semi-structured interview and were asked to respond to a teaching scenario of a reading comprehension lesson using their concept maps as a scaffold for providing recommendations for the teaching situation. The main objectives of the data analysis were fulfilled using descriptive statistics.

A 2 x 3 analysis of variance (ANOVA) (Keppel & Wickens, 2004) was conducted for the following three variables: (a) factor 1 included the level of teaching experience each candidate possessed; (b) factor 2 included the level of degree program being conferred on each teacher candidate, such as undergraduate or graduate level; and (c) the score on the concept maps each teacher constructed, which served as the dependent variable.

Within the ANOVA, *f* tests were performed on the main effects for the factors of school and experience and the interaction between these two factors. Follow-up tests were conducted to assess whether main effect tests, interaction tests, or both, were significant. These omnibus tests evaluated the following questions:

1. Are the concept map score means (dependent variable) the same across the two preparation programs (factor 1) averaged across levels of experience (factor 2)?
2. Are the concept map score means the same across levels of experience (factor 2) averaged across the two preparation programs (factor 1)?
3. Are there differences in the concept map scores among preparation programs across levels of experience?

Each concept map was coded and entered into an Excel database (Microsoft Excel, 2008). Figures were created within Excel, including frequencies. Finally, an ANOVA was conducted to examine differences in scores using the statistical software, SPSS, for data analysis (SPSS Inc., 2007).

Data Analysis

This section presents an analysis of the findings from the quantitative (Phase 1) and qualitative (Phase 2) phases. The research was conducted to test the hypothesis that special education teachers have limited exposure to literacy skills and thus have limited subject-matter knowledge and pedagogical content knowledge. The study employed a mixed-methods design whereby data were collected and analyzed during a quantitative phase (Phase 1) that preceded and guided the data that were collected and analyzed during a subsequent qualitative phase (Phase 2).

Phase 1

The purpose of the quantitative analysis was to inform the qualitative component of this mixed-methods study. Three different measures were used. First, syllabi for the courses in the participating special education degree programs were analyzed and compared across the two universities. Second, teacher candidates at each university completed a concept map

on reading comprehension, which was scored for complexity of conceptual thinking based on examples, relationships, hierarchies, and cross-links. Descriptive statistics were used to analyze the concept map scores across each university. A second analysis was completed based on the degrees conferred on study participants. A third measurement device evaluated the sophistication of the knowledge the teacher candidates depicted on their concept maps, and these scores were compared across the two participating universities.

Results for analysis of syllabi. The analysis of syllabi across universities was conducted to determine the amount of emphasis reading, reading comprehension, and literacy that was included in each course for degree requirements. Thus, for all syllabi in the certification sequence, each instance of course readings, tests, assignments, and projects was evaluated to determine the extent reading, reading comprehension, and literacy were emphasized. The level of implementation for each course was scored on a scale from 0-4, with 0 indicating that the component is not included in the course syllabus to 4 meaning that the component was modeled in the course with readings, tests, assignments, or projects and supervised practice was provided with instructor feedback given. The syllabi from the entire preparation program were scored on one Innovation Configuration Syllabus Evaluation Form (see Appendix G), and the highest score across the components is the overall score for each specific component. A summary of those scores is presented in Table 3.

Based on the analysis of syllabi, University A achieved the highest rating of 4 in literacy and reading. Two literacy-focused courses mentioned these components in class readings and projects with application in lesson plans or activities that were supervised by the instructor. With regard to reading comprehension, University A achieved a score of 3, meaning this component was mentioned in course readings and projects and applied in

Table 3

Results of Innovation Configuration Evaluation

	Literacy	Reading	Reading Comprehension
University A	4	4	3
University B	0	3	2

observations, lesson plans, or classroom modeling, but no instructor supervision and feedback was given.

The syllabi analysis for University B scored a 0 in literacy, as it was not mentioned in any class syllabi in the course sequence. The concept of reading scored a 3 meaning this component was mentioned in course readings and projects and applied in observations, lesson plans, or classroom modeling, but no instructor supervision and feedback was given. Reading comprehension was scored as a 2. This score is given when the component under study (i.e., reading comprehension) is included in required readings and tasks and/or quizzes, but no application of the skill is required in class activities or lessons.

Based on this analysis, teacher candidates from University A were exposed to more emphasis on each literacy component than students from University B. The premise that more exposure to each component leads to better understanding of each concept of reading is inherent within this analysis.

Results of concept mapping activity. The purpose of the concept map was to assess special education teachers' conceptual knowledge of reading comprehension. Study participants were instructed on how to construct concept maps and participated in a group co-construction of a concept map with the researcher. Each participant was given written instructions on the concept map procedures and given an opportunity to choose an alternative

format to demonstrate their conceptual knowledge of reading (see Appendix B). Nobody chose an alternative format for displaying their knowledge; thus, all maps were used for analysis. Scoring procedures as established by Trent et al. (1998, 2004) [see Appendix F].

An independent-samples t test was conducted to evaluate whether there were differences in the concept maps scores across two universities. The results of this test were not significant, $t(70) = .317, p = .8$ indicating that there was no difference between concept map scores between the students at two universities. Thus, for the following analyses, no distinctions were made between these groups (see Table 4).

Table 4

Complexity Score Means for University A and University B

	University A	University B	t	df
Complexity Score	99.18 (32.60)	102.1364 (44.19)	-.317	70

* $p < .05$ ** $p < .01$.

A one-way analysis of variance (ANOVA) was conducted to evaluate the relationship between type of degree conferred and complexity score on the concept maps. The independent variable, type of degree, included two levels: undergraduate and graduate. The dependent variable was the complexity score on the concept maps constructed by the study participants. The results of the ANOVA were not significant, $F(1,62) = 2.72, p = .10$. Thus, the main effect of type of degree was found not to be significant.

Also, a one-way ANOVA was conducted to evaluate the relationship between level of teaching experience and complexity score on the concept maps. The independent variable, years of teaching experience, included four levels: no teaching experience, one to three years,

four to six years, and seven or more years of experience. The dependent variable was the complexity score on the concept maps constructed by the study participants. The results of the ANOVA were not significant, $F(3,62) = 1.21, p = .31$. Thus, the main effect of teaching experience was found to be not significant.

The interaction effect between teaching experience and levels of degree was also not significant, $F(3,62) = 2.84, p = .84$ indicating that experience and level of degree had no effect on complexity scores (see Table 5).

Table 5

<i>Graduate and Undergraduate Complexity Scores Across Years of Experience</i>				
	<i>Df</i>	<i>F</i>	η^2	<i>p</i>
(A) Years of Experience	3	1.214	.094	.312
(B) Degree Program	1	2.715	.042	.104
A x B (Interaction)	3	.284	.014	.837
Error (within groups)	62			

* $p < .05$ ** $p < .01$.

A discriminate analysis (DA) was conducted to determine whether two predictors- subject-matter knowledge and pedagogical content knowledge could predict differences between low, medium, and high level complexity scores. Low complexity scores were two standard deviations below the mean (<80). Medium complexity scores ranged one standard deviation below the mean (>80) and one standard deviation above the mean (>140). High complexity scores were determined to be two standard deviations above the mean (>140). The overall Wilks' lambda was significant for subject-matter knowledge, $\Lambda = .74, \chi^2(4, N = 71) = 20.791, p < .01$, indicating subject-matter knowledge predicted higher

complexity scores. In addition, the Wilks' lambda was not significant for pedagogical content knowledge $\Lambda=.98, \chi^2(1, N=71) = 1.151, p = .283$ (see Table 6).

Table 6

Subject-Matter Knowledge and Pedagogical Content Knowledge Across Levels of Complexity

	Levels of Complexity			Wilks' Lamda	Chi-square	df
	Low (less than 80)	Medium (80-140)	High (over 140)			
Subject-Matter Knowledge	3.91 (3.31)	6.67 (4.15)	14.44 (12.46)	.741	20.791**	4
Pedagogical Content Knowledge	6.77 (5.01)	8.95 (10.22)	10.22 (7.68)	.984	1.151	1

Note. * denotes $p < .05$ and ** denotes $p < .01$.

Phase 2

In Phase 2, a purposive sampling procedure was used to select six teachers to be interviewed to determine how they enacted their knowledge of reading comprehension within a teaching scenario. Prior to the interview, interviewees received a list of questions, the teaching scenario, and a copy of the concept maps they had completed earlier (see Appendix D). The interview protocol was developed based on the literature review and a pilot study. Each interview was audio recorded to ensure accuracy, and detailed field notes were taken during each interview for later transcription and analysis.

Interview data analysis. Data from the interviews were analyzed using the constant-comparative method described by Glaser and Strauss (1967). Each transcribed interview and individual field notes were analyzed and compared to the quantitative sources of data. Each

code was constantly compared to all other codes to identify similarities, differences, and general patterns. Emerging themes, concepts, and explanations from the data were analyzed to explain or elaborate on the quantitative results. Major points were highlighted and sorted upon completion of each interview. Once all interviews were completed, the initial pieces of data were categorized into common themes. This analysis examined similarities and differences between each response by the interviewees. After all of the data had been organized in this manner, all transcripts and field notes were reexamined to ensure all data was represented.

Participants

Six special education teacher candidates were purposely selected for this phase of the study (see Table 7) based on the depth and breadth of their knowledge as displayed on their concept maps or previous teaching and preparation experience. Equivalent number of interviewees from each preparation program (3 each) was utilized to determine if comparable pieces of data were different or similar to other pieces of data specific to each university.

Emergent Themes

Data from the semi-structured interviews analyzed using constant-comparative analysis (Glaser & Strauss, 1967) revealed two main themes organized by subtheme. In addition, an analysis of how the interviewees responded to a scenario of a reading comprehension lesson revealed a third theme organized by level of knowledge in their responses based on learning taxonomies.

Table 7

Interview Participants

Interviewee Number and Institution	Degree seeking	Teaching Experience	Concept Map Complexity Score	Concept Map Analysis Level of Sophistication- Subject-Matter Knowledge Score	Concept Map Analysis Level of Sophistication- Pedagogical Content Knowledge Score
#1 University A	Undergraduate	Paraprofessional	122	10	15
#2 University A	Graduate	Psychology Degree Paraprofessional	139	10	17
#3 University B	Graduate	Psychology Degree 4-6 years' Teaching Special Education	294	22	23
#4 University A	Undergraduate	Paraprofessional	229	41	28
#5 University B	Graduate	Elementary Education Degree 4-6 years' Teaching Special Education	85	11	13
#6 University B	Graduate	Clinical Psychology Degree 1-3 years' Teaching Special Education	119	7	20

The first theme, experiences learning about reading comprehension, included two subthemes: (a) experiences in the preparation program and (b) experiences outside of their program (see Table 8). A second theme, beliefs, feelings, and attitudes about teaching reading

Table 8

Theme One: Experiences Learning About Reading Comprehension

Theme	Subtheme	Examples
Experiences learning about reading comprehension	Within preparation program	<ul style="list-style-type: none"> • Embedded within several courses • Separate literacy course(s)
	Outside of preparation program	<ul style="list-style-type: none"> • Professional development • Workshops/conferences • Community literacy experiences • Self-study • Observations of other teachers

comprehension, included two subthemes: (a) level of confidence and (b) challenges teaching students with special needs (see Table 9).

Table 9

Theme Two: Beliefs, Feelings, and Attitudes About Teaching Reading Comprehension

Theme	Subtheme	Examples
Beliefs, feelings, and attitudes about teaching reading comprehension	Level of confidence	<ul style="list-style-type: none"> • Based on experiences • Based on coursework
	Challenges teaching students with special needs	<ul style="list-style-type: none"> • Motivation • Feelings of failure or embarrassment • Appropriate materials

The third theme, level of knowledge teaching reading comprehension, revealed three levels of knowledge based on learning taxonomies exhibited by the teacher candidates: (a) subject-matter knowledge, (b) manipulations of reading comprehension concepts, and (c) application and generalization of reading comprehension concepts (see Table 10). This continuum of knowledge provided a framework to analyze their responses in relation to the complexity and sophistication scores the interviewees achieved on their concept maps.

Table 10

Level of Knowledge Teaching Reading Comprehension

Theme	Examples
Level of knowledge teaching reading comprehension	<p>Subject-Matter knowledge:</p> <ul style="list-style-type: none"> • Example score on concept map • Specific events or objects that are judged as valid instances of a concept • Listing of specific reading comprehension strategies or programs <p>Manipulations of reading comprehension concepts:</p> <ul style="list-style-type: none"> • Hierarchy score on concept map • Connections among concepts and examples, from general to specific • Matching student needs to specific reading comprehension strategies or programs <p>Application and generalization of reading comprehension concepts:</p> <ul style="list-style-type: none"> • Cross-link score on concept map • Integration and synthesis between one segment of a hierarchy to another segment of a hierarchy • Synthesizing across reading comprehension strategies or programs to address student needs in the present and developmentally

Theme one, subtheme one: Experiences learning about reading comprehension within preparation program. One of the major subthemes that emerged from the interview data was the difference in the experiences the special education teacher candidates had with reading comprehension across the preparation programs. For the most part, interviewees from University A had taken two separate courses in which the primary focus was on literacy.

In their undergraduate degree programs, all three interviewees had taken the class “Literacy Instruction for General Educators.” Interviewee #1 described her experience in the class as “we touched on factors that influence comprehension and incorporating comprehension building techniques into lesson plans.” A culminating activity for the class was to “prepare a guided reading lesson and teach our fellow students the lesson.” Interviewee #4 expanded on the content taught in this initial literacy class to include fluency concepts, vocabulary and background knowledge building activities, and determining student reading levels. She commented that the “more classes she takes, it starts to solidify more because the information is being repeated.” Interviewee #2 thought this was a difficult assignment because “your peers will judge you harder than kids.” The instructor monitored the peer lessons and provided feedback on the lessons during the activity. Furthermore, Interviewee # 2 (a graduate-level student) mentioned a second literacy class in her master’s program called “Literacy for Special Educators.” In this class, the instructor “touched on” comprehension in every lecture and taught students specific strategies to build comprehension from the Strategic Instruction Model®.

Subjects interviewed from University B described different experiences with reading within their preparation program. While they had completed two methods courses that included several class sessions that focused on reading, they had not taken a specific literacy

course. When asked what specific content in reading was taught in these methods classes, Interviewee #6 commented, “we mainly focused on decoding and fluency” and “only had one class session that we talked about reading comprehension.” Interviewee #6 said they read a chapter on reading comprehension in their class textbook that “touched on reading comprehension strategies.” Conversely, Interviewee #3 commented that she “learned the most from the [methods] class where I actually learned how to use the basic reading inventory and track a student through the entire semester.” She went on to describe the intervention she provided him during after school tutoring sessions once a week. “It was good for him and me to get physical proof on paper how he was benefiting and learning.” However, she commented that she was “surprised” when the student “didn’t really gain any improvements” at the end of the semester despite the one-on-one help.

When comparing responses on experiences with reading across the two preparation programs, the interview data analysis depicts the diversity in depth and breadth of instruction in reading. In addition, the differences in direct application of skills across the two schools varied. While students from University A had a more extensive exposure to reading within one or possibly two literacy courses, there was no direct application of the skills with actual students who struggle with reading. At University B, the teacher candidates experienced embedded exposure to reading concepts within methods courses. The candidates had direct application of skills with a semester long one-on-one tutoring component with a student who had difficulties in reading. Interestingly, the syllabi analysis for each university indicated that University A scored at the highest level of emphasis (4) on reading and literacy (4) in coursework, and an advanced level (3) in reading comprehension. Conversely, University B scored marginally (2) in reading comprehension and received the lowest score (0) in

emphasis on literacy as a construct. However, University B did score at an advanced level (3) in emphasis on reading in general. Despite the direct application of skills learned about reading with a student, the tutoring was not supervised by the instructor as part of the reflective process, thus the lower score.

Theme One, subtheme two: Experiences learning about reading comprehension outside of preparation program. A major theme across all interviewees was their exposure to reading comprehension outside of their preparation programs. All of them stated they had participated in professional development or workshops that focused on reading or reading comprehension. Four interviewees (#1, #2, #3, and #5) had participated in professional development that focused specifically on reading comprehension. Interviewee #1 and #2 were instructed in the use of the *Read Naturally* (Ihnot, 1992) program as part of their work expectations as paraprofessionals. Interviewee #3 participated in a major reading initiative within her school district as the result of not meeting Annual Yearly Progress on state assessments for more than two years. Furthermore, Interviewee #3 described the degree of professional development she participated in as “taking whole days to talk about reading comprehension” and experiencing as much as “20 hours per year for the last three years” of training. Interviewee #5 participated in professional development delivered by the regional professional development center that emphasized initial reading skills as a prerequisite for reading comprehension.

Other experiences outside of preparation programs included self-study activities. For example, Interviewee #4 read books on the subject of reading and used the Internet to find instructional ideas. Interviewee #6 considered the pressing needs of her caseload of students and “looks for information” to help them. One interviewee (#4) expressed how fortunate she

was to “observe an awesome first-grade teacher” delivering reading instruction while she was a paraprofessional assigned to the room. The general education teacher used “so many strategies and was wonderful to watch” and she was “excited” about the stories the class was reading, she commented.

The subtheme of experiences outside preparation programs demonstrates the intense focus currently placed on providing teachers with skills to deliver instruction in reading. Even after teachers leave a preparation program, they participate in continuous learning and expand on this new learning. The process to assimilate this new knowledge with the knowledge gained in a preparation program is influenced by the individual teacher’s beliefs and attitudes about reading.

Theme two, subtheme one: Level of confidence. One of the major subthemes that emerged from the interview data was the interviewees’ confidence level in their skills to teach reading to adolescents. All teacher candidates had some experience teaching students in grades 4-12 as a paraprofessional, substitute teacher, or special education teacher. Interviewee # 6 stated that she felt it was “definitely not an area I am the most confident,” despite her previous experience working as a paraprofessional in a middle school and supporting students in reading tasks. Conversely, Interviewee #1 felt “pretty good” about it because of her years of experience as a paraprofessional before she entered the preparation program. Based on her experience teaching in a self-contained classroom for students with intense academic needs, Interviewee #3 felt pretty confident that she could deliver instruction in reading comprehension effectively. Interviewee #5 felt confident instructing “your typical LD child” but was less sure when considering students with lower ability in reading.

While five out of six interviewees felt confident to fairly confident in their skills to

teach reading comprehension, most related it to understanding the developmental process of reading acquisition or knowing specific strategies. It should be noted that no interviewee supported their feelings of confidence based on learning experiences gained within their preparation program.

Theme Two, subtheme two: Challenges teaching students with special needs. A major theme that surfaced from all interviews was the difficulties of teaching adolescents how to read due to poor motivation and past negative experiences reading. All interviewees attested to students' negative feelings towards reading because of embarrassment to read aloud. Interviewees also attributed students' lack of motivation to a lack of materials that interest adolescent readers with limited skills. For example, Interviewee #6 stated that she "could see the students' frustration" when having to read aloud or read from "babyish" materials. Three of the six interviewees (#2, #5 and #6) felt it was their job to motivate their students and make them feel comfortable about attempting to read.

All interviewees attributed students' negative feelings about reading to past experiences of reading aloud in front of peers or lack of access to age-appropriate and interesting materials. No mention was made of the role of a dynamic learning environment where students learn strategies to compensate for deficits. This oversight leads to the question of whether interviewees' preparation programs included the importance of an engaging learning environment as part of the curriculum.

Since each teacher candidate interviewed demonstrated higher levels of complexity on their concept maps, their scores across each level of knowledge were compared with the scenario data analysis. The scores on the concept maps supported a discussion of the specific representations of each of the three levels of knowledge. Thus, the scenario asked

participants to suggest alternative instructional techniques and specific strategies to teach the concept of summarization. The results of correlations of concept map scores and level of knowledge enacted in a scenario of a reading comprehension skill follow.

Theme three: Level of knowledge of reading comprehension. One of the major themes that emerged from the interview data was the special education teachers' level of knowledge as enacted in the scenario part of the interview. As supported in the literature review, the current trend of assessing teachers' subject-matter knowledge was prevalent in the research (McCutchen et al. 2002; Moats, 1994, 2009; Moats & Foorman, 2003).

University A interviewees. Interviewee #1's scores on her concept map were as follows: examples = 28, relationships = 29, hierarchy = 35, and cross-links = 30. Her overall complexity score was 122. The level of sophistication of her concept map revealed a score of 10 on subject-matter knowledge and a score of 15 on pedagogical content knowledge. During the scenario portion of the interview, Interviewee #1 suggested the use of "picture walks" as a way to assess students' background knowledge on the passage to be summarized. A further recommendation included preteaching any unknown vocabulary, "I think it would be helpful to review any unknown vocabulary." However, she made no reference to how she would determine what vocabulary the students were unsure of in the passage to be summarized.

Furthermore, this interviewee listed the use of story elements to improve comprehension, "I think it is important that they understand why story elements are important to reading and why they are the building blocks of reading." While no clear connection to why story elements would facilitate the skill of summarizing text was provided in her response, she did list the ideas of character, setting, and plot including climax and

resolution as part of a story map. Interviewee #1 also suggested the use of several “practice paragraphs” of the reading selection in which she would model summarizing at the end of each paragraph. She also mentioned asking the students questions or filling out a “questionnaire” throughout the modeling activity to facilitate discussion of the text, “We could go through various passages and try to pick out what is the main idea - What do you think this or that means? Then they would get some practice [in summarizing].” Based on the descriptors for the levels of knowledge, as defined in Figure 1, Interviewee #1 listed specific events or strategies to facilitate summarization skills but made little connection to how these strategies would teach students how to summarize. Little connection to the skill and student learning was discussed, but instead she listed independent activities that do not build upon other skills to increase comprehension of text. The level of sophistication of the concept map completed by Interviewee #1 demonstrated lesser subject-matter knowledge than her pedagogical content knowledge.

Interviewee #2 received the following scores on her concept map: examples = 26, relationships = 33, hierarchy = 30, and cross-links = 50. Her overall complexity score was 139. The level of sophistication of her concept map revealed a score of 10 on subject-matter knowledge and a score of 17 on pedagogical content knowledge. Interviewee #2 related an example of “breaking it down into separate lessons” to facilitate summarization and to use “think-alouds” to lead group discussion. However, she made no reference to the significance of task analysis to acquire the skills to summarize. In addition, this participant suggested “to use the different parts of the story to create a summary” as a group and then “write down what we talked about the story and the different parts” to complete the summary as a group. While she suggested scaffolding the summarizing activity, she did not reference the cognitive

processes involved when writing to demonstrate comprehension. Despite reference to modeling the active processes of reading, Interviewee #2 only made rudimentary connections to the strategies students need to summarize.

Interviewee #4 received the following scores on her concept map: examples = 71, relationships = 73, hierarchy = 85, and cross-links = 0. Her overall complexity score was 229. The level of sophistication on her concept map revealed a score of 41 on subject-matter knowledge and a score of 28 on pedagogical content knowledge. This participant started her scenario interpretation by suggesting to select passages at the students' "independent reading level" to learn the skill and to employ "prereading" activities such as looking at the "title, whose the author, whose the illustrator, if there's pictures and the front and back cover." She went on, "And then I would try to activate their prior knowledge" about the passage and "think aloud" what she personally knows about the passage. If the students did not have any prior knowledge, she would develop a PowerPoint with images or "something they could view" and this would "give them some knowledge."

Throughout her discussion of the scenario, Interviewee #4 provided many examples of specific ways she would model summarization skills. She would "fill out a graphic organizer" together with the students as they read and reread a passage over several days because she felt "they need to read it more than once to be able to summarize and comprehend." Furthermore, she stated that as she read the passage aloud "I would stop and ask, 'Where's this story taken place?' hmm and then I would figure that out" in reference to finding the setting of a story or some other components of the text. Nonetheless, Interviewee #4 did not bring up the direct connection between self-questioning and comprehension or the relevance of group discourse for facilitating comprehension. Interviewee #4 demonstrated a

higher level of sophistication of pedagogical content knowledge, meaning she understood the summarization skills of reading comprehension and related them in the context of how she would instruct the skill. However, while her concept map complexity scores were one of the highest of all sampled, she did not synthesize or generalize the skills in her scenario suggestions to the developmental process of reading skills to facilitate comprehension.

University B interviewees. Interviewee #3's scores on her concept map were as follows: examples = 80, relationships = 94, hierarchy = 110, and cross-links = 10. Her overall complexity score was 294. The level of sophistication on her concept map revealed a score of 22 on subject-matter knowledge and a score of 23 on pedagogical content knowledge. This interviewee began her scenario suggestions by discussing the ultimate goal of teaching students how to summarize, "I would determine what I want each of the students to get out of the lesson." In addition, she commented on students' different levels of ability and, thus, the need for "differentiated instruction" techniques. She then suggested specific accommodations warranted for each student considering the diversity of disabilities that could be present. Such things as "highlighting or underlining" important information, "taped books," or "bigger [text] font so it easier to read," and "microphones and recorders" to do an oral summary were specific accommodations suggested. Interviewee #3 stated that "visualizing has been the way to summarize" with my students this year because "they are so low." She went on to relate how they would "listen to a story on tape" and then "draw a picture of what we visualized was happening" in that section of the book. The students then "tell me what happened" while looking at the pictures they drew. In addition, Interviewee #3 suggested tapping into the "multiple intelligences" and "five senses" to connect with the text and provide experiences with the content of the story. "We read a story about a jungle

animal and I had jungle music playing.” She proceeded to explain, “So sometimes even if they can’t remember what the story was about they think about the jungle music I played,” and it “links the story to their senses.”

While Interviewee #3 demonstrated sensitivity to the differing needs of students with special needs, her suggestions did not make connections among concepts and examples of summarization to the accommodations she presented. Her concept map depicted large numbers of strategies and examples of reading comprehension as seen in her scores for examples and hierarchies. However, her scores in cross-links, or making connections, were markedly lower.

Interviewee #5’s score on her concept map were as follows: examples = 15, relationships = 20, hierarchy = 30, and cross-links = 20. Her overall complexity score was 85. While this score was relatively low in comparison to those of the other interviewees, this interviewee was chosen based on her elementary education degree. The level of sophistication on her concept map revealed a score of 11 on subject-matter knowledge and a score of 13 on pedagogical content knowledge. The first suggestion by this interviewee was to break down the task of summarizing “into little parts” and then methodically “go through the steps” as they read a selection instead of “waiting till the end” to summarize. She commented that content-area books take “a more extensive amount of time to read” and that “modeling is crucial” when determining story elements. Interviewee #5 related an example of “need to have something visual to fill out as they go” to facilitate summarization. She made no reference to the significance of providing a graphic organizer to visually identify key points and ideas as students summarize text.

Interviewee #6’s scores on her concept map were as follows: examples = 36,

relationships = 13, hierarchy = 50, and cross-links = 20. Her overall complexity score was 119. The level of sophistication of her concept map revealed a score of 7 on subject-matter knowledge and a score of 20 on pedagogical content knowledge. Initially, the suggestions made by this interviewee were to determine if the students had “decoding abilities” to read the selection or the “energy level” to decode the text fluently. She suggested alternative materials at the students’ “independent reading level and not instructional or frustration level.” In addition, she suggested that the teacher determine “what motivates” the students to read and provide those “motivators.” Furthermore, she suggested “discussing the text” to ascertain their “background knowledge.” Interviewee #6 discussed the use of story maps to facilitate comprehension, stating, “They could use a story map and have places on it we could do all together.” She went on to describe how the “teacher would do it,” then “we would read another story together,” and, finally, “have the children fill it out on their own.” In addition, this interviewee suggested sequencing the story using “sentence strips” at the “beginning, middle, and end of the story” and then having the students “practice putting the strips in the correct order.” Interestingly, this interviewee also suggested determining if the students had adequate “expressive and receptive language” to summarize or if “language problems kept them from telling you what they know.” While her description related the idea of gradual release of responsibility in the use of story maps and sentence strips, she did not relate how scaffolding instruction, nor the use of a graphic organizer like a story map, aids in comprehension. While she understood the importance of language skills in reading comprehension, she did not suggest specific strategies to accommodate for this issue.

Summary

The study's primary goals were to determine (a) the conceptual understanding of special education teachers' subject-matter knowledge and pedagogical content knowledge of reading comprehension, (b) their experiences with reading instruction in preparation classes, and (c) how special education teacher candidates apply their knowledge of reading comprehension to their conception of effective instruction in reading comprehension scenarios.

Through a mixed-methods research process, data were collected and analyzed in order to achieve a more comprehensive understanding of how special education teachers conceptualize reading comprehension. The next chapter discusses the qualitative and quantitative findings as well as implications and recommendations for future research.

CHAPTER V

DISCUSSION

This study was conducted to test the following hypotheses: (a) special education teachers learn subject-matter knowledge and pedagogical strategies within their preparation programs, (b) special education teachers make sense of what they learn by appropriating “tools” or outward displays of their knowledge (i.e., concept maps), and (c) special education teachers have a specialized knowledge of teaching reading due to the range of skills they encounter within their students’ abilities in reading.

The first question this research study sought to answer was: As captured in concept maps, what do special education teachers report their conceptual understanding of subject-matter knowledge and pedagogical content knowledge of reading comprehension to be? Based on analysis of the data presented in Chapter IV, special education teachers from two different universities demonstrated limited subject-matter knowledge and pedagogical content knowledge, as reflected on their content maps.

The second question was: How do the experiences with reading instruction in their preparation classes mediate special education teachers’ visual representation of their content knowledge and pedagogical content knowledge of reading comprehension? Based on an analysis of syllabi and concept map complexity scores, class content and experiences do not adequately prepare teachers to access and communicate the knowledge they have acquired in their preparation programs.

The final question that this study sought to answer was: What was the evidence of subject-matter knowledge and pedagogical content knowledge represented in concept maps of special education teachers in preparation programs and how is it applied to their

conception of effective instruction in reading comprehension scenarios? Based on the concept map analysis form and interview data, the knowledge constructs teachers enacted in the reading comprehension lesson demonstrated low levels of knowledge of research-based techniques to teach reading comprehension.

Interpretation of the research data became more meaningful when both sources, the quantitative data and qualitative data, were compared and contrasted. The following section discusses the data collected as they relate to the research questions. Data analysis revealed several conclusions about the depth and breadth of special education teacher candidates' knowledge of reading comprehension. The chapter ends with a presentation of limitations of the study and recommendations for future research.

Conclusions

Influence of Preparation Programs on Teachers' Knowledge

Study results showed that special education teacher candidates acquired low levels of subject-matter knowledge and pedagogical content knowledge in their preparation programs. This was evidenced by nonsignificant results related to specific knowledge, as depicted on concept maps and further supported by the qualitative interview data.

Several conclusions can be drawn from these findings. First, the limited evidence of knowledge constructs on the concept maps and interviews indicated that teacher candidates were not connecting literacy concepts taught in their preparation courses to teaching reading. Thus, the bridging of class content to practice was not evident in the visual representation of their knowledge (i.e., concept maps). Instead, the maps demonstrated a wide range of information about reading comprehension that ranged in level of complexity, including knowledge of instructional strategies such as modeling and think-alouds. In addition,

participants demonstrated an awareness of the foundational reading skills for comprehension like vocabulary and fluency, but few teacher candidates were able to integrate and synthesize the skills (i.e., cross-links) to understand how reading comprehension fits in the larger system of literacy instruction. This was further supported by the interviews with six participants who demonstrated higher levels of complexity on their maps than their classmates. Despite these teacher candidates having a breadth of knowledge of reading, as depicted in their maps, during the followup interviews, they recommended few evidence-based pedagogical approaches to teaching reading comprehension (e.g., self-questioning). Considering the range of knowledge complexity scores found among study participants, teacher educators must consider the schemas teachers create about literacy while in a preparation program. Concept maps provide teacher educators a way to judge the conceptual understanding the students in their classes possess and tailor the class content accordingly.

The syllabi analysis using the Innovation Configuration Syllabus Evaluation Form (Smartt & Reschly, 2007) indicated adequate levels of focus on reading and reading comprehension, but the knowledge obtained was not translated into knowledge constructs the teacher candidates could communicate effectively. The teachers' conceptual understanding of literacy concepts was not reflected in practice as demonstrated by their responses to the scenario. Having literacy concepts embedded in the course sequence or delivered in courses that solely focused on literacy did not result in depth or breadth of knowledge. Teacher candidates need to engage in a range of concept formation activities to solidify their understanding of subject matter and pedagogical content knowledge and to develop a flexible and fluid way of using this knowledge when presented with student learning challenges. Concept formation activities could include concept mapping, case studies, talking about

knowledge, relationships, and applications, critical assessment of their and other teachers' problem-solving with application in clinical teaching experiences.

Teacher Candidates' Outward Displays of Knowledge

Results from the interviews indicated that teacher candidates approached the scenario on summarization with diverse instructional strategies. The specific recommendations the interviewees gave were primarily focused on foundational skills for summarization such as word decoding and understanding necessary vocabulary. Further suggestions included accessing students' background knowledge or providing diverse experiences to build background knowledge. Also noted was analyzing the tasks students are to complete and "breaking it down" into manageable parts.

While these suggestions for the teaching scenario were proficient examples of how to analyze the students' current functioning level and appropriate modifications to the lesson, they were not examples of specific subject-matter knowledge or effective teaching strategies for reading comprehension.

This lack of a consistent pedagogy sheds light on how special education teachers implement effective teaching practices and the resulting student outcomes. Despite the efforts from professional organizations like the Council for Exceptional Children and the International Reading Association to develop standards on literacy instruction, little consistency was found in the teaching practices of the special educators in this study.

Special Educators' Specialized Knowledge

The third issue this study hoped to elucidate was the necessity for special education teachers to possess a specialized knowledge of reading to address the diverse literacy needs of special education students. The results of the Concept Map Analysis Form (see Appendix

E) used to determine what types of knowledge teacher candidates possessed were analyzed along with interview data. Overall, the teachers interviewed possessed more subject-matter knowledge (SMK) of reading comprehension based on the sophistication score on their concept maps and followup interviews. The means for pedagogical content knowledge (PCK), in turn, did not produce significant influence on complexity scores for concept maps. In light of Shulman's definition of PCK (1987), special education teachers need to possess a deep understanding of how to unify knowledge of reading comprehension and pedagogy to make changes to instruction for special education students.

The participants in this study produced relatively low levels of knowledge of SMK and PCK. Considering the "surprise" Interviewee # 3 felt when the student made no improvements after direct instruction in reading, teacher educators must connect the subject-matter knowledge delivered in lectures to application of skills in clinical settings to unify content with pedagogy. The teacher candidates in this study demonstrated similar responses on how to instruct children in reading as demonstrated in the interviews. While many of their responses were sound teaching practices (i.e. breaking down tasks), they failed to demonstrate research-based instructional techniques specific to teaching reading comprehension. The ultimate goal for many teacher educators is to prepare teachers who can respond to the needs of students with effective practices. To develop the subject-matter knowledge and pedagogical content knowledge in teacher candidates, teacher educators need to expand their teaching practices to include this conceptual foundation.

Limitations

The potential limitations of this study include the novelty of participants having to construct maps based on procedures outlined in the study orientation. Participants may have

focused primarily on the procedures to construct the map instead of the quality of their representation of the literacy concept (McClure, Sonak, & Suen, 1999), or constructing a visual representation of their knowledge may not have been their preferred modality for demonstrating knowledge, hence negatively affecting their scores.

Further limitations may be a result of a lack of psychometric data on concept mapping. No standard procedures for quantitatively estimating the levels of conceptual knowledge have been presented in research thus far. Therefore, the reliability and validity of using concept maps to measure teacher knowledge have not yet been ascertained. In addition, the lack of observational data of teachers related to their teaching behaviors when providing instruction in reading comprehension or their effectiveness with students who struggle with comprehension limits this study.

Finally, to narrow the scope of this study, the participants and setting selection created bounded system meaning only participants who were currently enrolled in two preparation programs were studied. Thus, participant teachers do not fully represent the general population of teacher educators, only a small section of the general population. The small number of preparation programs participating in this study and the lack of longitudinal results across successive cohorts of students from each program pose other potential limitations. Thus, a larger sample of teachers over time in a variety of preparation programs that encompass a broader representation of special education programs would strengthen the results of this study.

Future Research

The levels of knowledge special education teachers possess on literacy and how that relates to pedagogical knowledge of literacy concepts is in need of further study. Various

studies have specifically looked at general education teachers (McCutchen et al. 2002; Moats, 1994, 2009; Moats & Foorman, 2003) and the measurement of their understanding of literacy concepts, but special education teachers' knowledge has not surfaced as a result of this line of research.

The complex connections between special education teacher preparation, knowledge, and practice of literacy concepts is a crucial, yet emerging area of study for researchers (Zumwalt & Craig, 2005). Special educators' knowledge of reading concepts is not only influenced by their understanding of the subject matter, but also the amalgam of content and pedagogy that enables transformation of content to meet the diverse needs of students with disabilities.

In order to add to the growing body of empirical research in special education teacher education, this study documented the conceptual knowledge reading teachers possessed as they completed the certification process in special education. It is increasingly important that teacher educators understand how students conceive course content and how this content is situated within the context of the classroom. This study mediated how teachers enrolled in a special education certification preparation program visually represented their conceptual knowledge of reading comprehension with concept maps. Interviews and scenarios supported how teachers enacted this knowledge into practice.

Future studies should attempt to validate the concept map scoring procedures to measure knowledge constructs. In addition, followup studies need to examine how special education teachers enact their knowledge within actual classroom as they provide instruction in reading comprehension.

Summary

In summary, this study investigated special education teacher candidates' knowledge of literacy concepts. The continued documentation of low literacy levels of special education students warrants a comprehensive study of the knowledge special education teachers possess on reading. Special education teachers need strong content knowledge of reading, as well as pedagogical skills specific to reading (Brownell et al., 2005). Preparation programs need to focus not only on the content knowledge of reading, but also on the effective practices to teach students with reading difficulties.

This study used both quantitative and qualitative measures to discern how special education teachers depict their conceptual knowledge of reading comprehension. While the quantitative results revealed no significant variables that could explain higher levels of knowledge, the use of concept maps could enhance how preparation programs evaluate their approach to instructing special education candidates about literacy.

Descriptive research, like this study, is important to the field of special education and students with disabilities because its findings may be used to design effective preparation programs for future special educators. Until preparation programs develop a consistent approach to preparing special educators in literacy concepts, it will be difficult to adequately assess teacher's knowledge of reading. This study was the first step in ascertaining how concept maps could approximate different knowledge domains.

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Appendix A
Letter Requesting Access to University Preparation Program

Dear _____ (Dept chair):

In an effort to understand the knowledge base of special education teachers of literacy concepts, your assistance is being requested. As part of a dissertation study on teacher knowledge, I would like to assess the conceptual knowledge of students in a master's level special education class at your institution. This would entail my presence as a guest lecturer in this class for approximately 60-90 minutes to describe the study, obtain permission by the students to participate, co-construct a concept map together, and deliver instruction on how to create concept maps to depict their knowledge. Based on previous pilot studies, the maximum amount of time would be 120 minutes. To compensate students who agree to participate in this activity, I would like to negotiate with the lead instructor for the class to provide an incentive to participate in the concept mapping activity. Examples of incentives for participation in this concept mapping activity could include participation points for the class session or a replacement for a recurring class assignment such as a journal reflection.

As a follow up to this initial phase of data collection, purposively selected students will be asked to participate in a semi-structured interview in order to ask specific questions about their concept maps and to pose a scenario for the interviewees to enact their knowledge within a reading lesson depicting students struggling with comprehension. Those who agree to participate in these interviews will receive monetary compensation in the amount of \$50. These interviews will be conducted outside of class time at a convenient time for the interviewee.

A benefit to your program agreeing to participate in this study will be a detailed analysis of the level of understanding students in your preparation program have about a literacy concept. Knowing how your students have conceptualized the content presented in your preparation courses, as well as giving the instructors a picture of the collective knowledge of a literacy concept to inform instruction can be very beneficial.

I know how busy you and your staff are. With that in mind, I would like to explain this study more in depth to you and/or the lead instructor who agrees to open his/her class to my study. I hope to come early in the spring semester to guest lecture in this class so as to give information that may enhance course content for the instructor. I will be contacting you in the next few weeks to confirm participation in this study. Thank you for your time and I hope we can talk soon about this important line of research.

Susanne James
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Appendix B

Orientation to the Study

Introduction to Assignment:

“A concept map is a way of organizing ideas about a topic so that relationships among various sub-topics are displayed visually” (Morine-Dershimer et al., 1992, p. 472). You are being asked to develop a concept map to depict your individual ideas about reading comprehension and instructing students who struggle with this. After co-constructing a simple concept map as a class, you will be asked to draw another concept map to assist us in understanding your knowledge of reading comprehension based on your learning experiences within this preparation program as well as your personal knowledge and beliefs about this facet of literacy.

Directions:

1. On the back of the paper provided to you, jot down all the ideas and terms that come to mind when you think of ***reading comprehension***.
2. Think about how all the ideas and terms you wrote down could be organized into categories and subcategories.
3. Arrange the categories, subcategories, ideas, and terms around the central concept of reading comprehension in a way that will demonstrate the relationships among concepts.
4. Add any details that could elaborate or further illustrate the concepts depicted. Be specific as possible.

Adapted from Correa, V., Hudson, R.F., and Hayes, M.T. (2004). Preparing early childhood special educators to serve culturally and linguistically diverse children and families: Can a multicultural education course make a difference?, *Teacher Education and Special Education*, 27 (4), 323-341.

Appendix C

Consent Form

Dear Student:

You are invited to participate in a research study on the knowledge base special educators possess about literacy concepts. The following information is provided in order for you to make an informed decision whether you will or not participate in this study. If you have any questions, please do not hesitate to ask. You are eligible to participate in this study because you are currently in a preparation program to receive certification or endorsement in special education.

The purpose of this study is to investigate the conceptual knowledge special educators possess about reading comprehension across preparation programs as represented in concept maps. This study will take place in one class session and your instructor will compensate you with class points for participating in the concept mapping activity. A few of your fellow students will be asked to participate in follow-up interviews to discuss their maps. Further compensation will be given to the students who participate in the interviews.

There are no known risks associated in this research. You will be instructed on the procedures to complete a concept map and will co-construct a map as a class before doing your own map on reading comprehension. If you choose not to sign this permission form, your maps will still be submitted to your instructor to receive the compensation. If you would prefer to depict your knowledge in other formats than a visual representation, you will be provided alternative formats.

The information obtained in this study will be published in a dissertation, and may be published in educational journals or presented at educational meetings, but your identity will be kept strictly confidential.

I agree to participate in this study. I understand any information I provide will be kept confidential.

Your Signature

Date

Appendix D

Interview Questions and Scenario

1. Describe any experiences you have had learning about reading comprehension in your preparation program.
2. Describe any experiences you have had learning about reading comprehension outside of your preparation program.
3. How confident do you feel about instructing students in literacy concepts like reading comprehension?
4. What is the most challenging aspect of teaching adolescents (grades 4-12) who struggle with reading?
5. What are your beliefs about how best to teach students how to read?

I am now going to give you a scenario of a reading comprehension lesson. I want you to consider the information you presented in your concept map and your knowledge of teaching reading comprehension. How would you change or enhance the lesson? What specific recommendations do you have about the lesson in the scenario?

Based on classroom assessments, Ms. Jenson has decided to form a group of five students who are struggling with this the concept of summarizing. These students were provided classroom instruction on summarizing that consisted of determining story elements in order to provide a framework on how to describe what a story was about. The students ranged in ability to use these story elements from Jessie who was only able to decipher the main character to Lilly who was finding it difficult to determine the problem and resulting solution to the paradox in the story. The students reading ability ranged from 1-2 years below grade level and are diagnosed with a specific learning disability in reading. Ms. Jenson needs to determine alternative instructional techniques and specific strategies that will aid in the students understanding how to summarize text in order to comprehend what they are reading. What would you suggest?

Appendix E

READING COMPREHENSION CONCEPT MAPS ANALYSIS (4/23/11)			
Participant Number _____			
SUBJECT MATTER KNOWLEDGE (Content Knowledge) – the amount and organization of knowledge in the mind of the teacher; the facts and concepts in the domain of reading comprehension (Shulman, 1986)		PEDAGOGICAL CONTENT KNOWLEDGE – representations of specific content ideas that include an awareness of the students attainment of reading comprehension; what makes comprehending text easy or hard for students (Shuman, 1986)	
KNOWLEDGE OF CONTENT _____ Developmental sequence of reading acquisition _____ teach decoding skills _____ teach vocabulary _____ word knowledge _____ active comprehension strategies _____ monitoring comprehension _____ Utilization of assessment information _____ Connecting instructional strategies _____ standards _____ district curriculum _____ benchmarks _____ Electronic text _____ hypertext _____ Educational resources _____ supplemental materials _____ websites for students _____ websites for teachers		FOUNDATIONAL SKILLS TO COMPREHEND TEXT _____ Word Decoding _____ Vocabulary _____ content _____ topic _____ Motivation _____ interest in content _____ interest in activity _____ interest in reading material _____ Metalinguistic awareness _____ Background Knowledge _____ world knowledge _____ cultural knowledge _____ Beliefs _____ self-efficacy as a reader _____ Fluency _____ Comprehension consequences _____ knowledge _____ application _____ Engagement _____ Attention _____ Memory _____ Understanding beyond the text _____ Picture text content (visualization) _____ Self-monitoring _____ Setting goals for reading _____ Reflectivity _____ Persistence	
KNOWLEDGE OF INSTRUCTIONAL STRATEGIES _____ Modeling _____ gradual release of responsibility _____ Direct instruction _____ explicit _____ systematic _____ direct explanation _____ Transactional Strategy Instruction _____ Concept-Oriented Reading Instruction (CORI) _____ QAR (Question – Answer – Relationship) _____ PALS _____ K-W-L _____ Reciprocal Teaching _____ Reading Recovery _____ Strategic Instructional Model _____ Direct Reading Activity (DRA) _____ Directed Reading-Thinking Activity (DR-TA) _____ Scaffolding _____ responsive elaboration _____ mnemonics _____ Guided Practice _____ guided reading _____ Think-alouds _____ metacognition _____ read-alouds _____ Higher Order Thinking		KNOWLEDGE OF STUDENT FUNCTIONING LEVEL _____ Word Decoding _____ Vocabulary _____ content _____ topic _____ Motivation _____ interest in content _____ interest in activity _____ interest in reading material _____ Metalinguistic awareness _____ Background Knowledge _____ world knowledge _____ cultural knowledge _____ Beliefs _____ self-efficacy as a reader _____ Fluency _____ Comprehension consequences _____ knowledge _____ application _____ Engagement _____ Attention _____ Memory _____ Understanding beyond the text _____ Picture text content (visualization) _____ Self-monitoring _____ Setting goals for reading _____ Reflectivity _____ Persistence	

KNOWLEDGE OF INSTRUCTIONAL STRATEGIES	STUDENT STRATEGIES
<div>_____ Cooperative Learning</div> <div>_____ Think-Pair-Share</div> <div>_____ Reader's Workshop</div> <div>_____ shared readings</div> <div>_____ Setting a purpose for reading</div> <div>_____ author's purpose</div> <div>_____ Graphic/Semantic Organizers</div> <div>_____ Questioning</div> <div>_____ question answering</div> <div>_____ question generation</div> <div>_____ Text structures</div> <div>_____ story structures</div> <div>_____ differentiating between narrative and expository</div> <div>_____ question-answer</div> <div>_____ problem-solution</div> <div>_____ descriptive</div> <div>_____ cause-effect</div> <div>_____ sequence</div> <div>_____ compare-contrast</div> <div>_____ Feedback</div> <div>_____ positive</div> <div>_____ explanatory</div> <div>_____ Reinforcement of skills</div> <div>_____ reteaching</div> <div>_____ Facilitation of discussion</div> <div>_____ meaning is socially constructed</div> <div>_____ classroom discourse</div> <div>_____ speaking and listening</div>	<div>_____ Use multiple strategies in combination</div> <div>_____ adapt thinking</div> <div>_____ self-regulated</div> <div>_____ Preview Texts</div> <div>_____ Skim and scan</div> <div>_____ "Fix-up" strategies</div> <div>_____ "Click or Clunk"</div> <div>_____ seek clarification</div> <div>_____ rereading</div> <div>_____ adjust speed based on complexity of text</div> <div>_____ Text/Story Structures</div> <div>_____ Visualization</div> <div>_____ image construction</div> <div>_____ mental images</div> <div>_____ Predications</div> <div>_____ Summarization</div> <div>_____ main ideas</div> <div>_____ eliminate unnecessary information</div> <div>_____ synthesize multiple texts</div> <div>_____ Underlining/Note-taking</div> <div>_____ Self-Questioning</div> <div>_____ Paraphrasing</div> <div>_____ Inferencing</div> <div>_____ associations</div> <div>_____ extensions</div> <div>_____ Synthesizing</div>
CLASSROOM CONCERNS	
<div>_____ Student engagement</div> <div>_____ attending to student cues</div> <div>_____ Behavior management</div> <div>_____ Organizational plan for reading instruction</div> <div>_____ instructional groups</div> <div>_____ Time to read</div> <div>_____ reading calendars</div> <div>_____ independent reading</div>	

Appendix F

Concept Map Scoring Procedures

Concept map component	Description	score
Examples	specific events or objects that are judged as valid instances of a concept	1 pt
Relationships	Connecting lines and linking words between two concepts, between a concept and an example, or between two concepts	1 pt
Hierarchies	Connections among concepts and examples, from general to specific	5 pts
Cross-links	Integration and synthesis between one segment of a hierarchy to another segment of a hierarchy	10 pts

Adapted from Novak and Gowin (1984) and Jones and Vesilind (1996)

Appendix G
Innovation Configuration Syllabus Evaluation Form

	Score = 0	Score = 1	Score = 2	Score =3	Score = 4	Rating
Instructions: Place an x under the appropriate level of implementation for each course syllabus that meets the criteria specified from 0-4. Score and write each item separately.	No evidence that the component is included in the course syllabus.	Syllabi mention the component in course syllabus.	Syllabi mention component in class and required readings and tasks and/or quizzes.	Syllabi mention component in class with readings, tests, and assignments and projects for application: observations, lesson plans, classroom modeling	Syllabi mention component in class with readings, tests, and assignments and projects for application: observations, lesson plans, classroom modeling plus supervised practice with the component.	The rating in this column is the highest score for any syllabus on each of the respective components.
Literacy						
Reading						
Reading Comprehension						